

JUNE  
1950

# Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

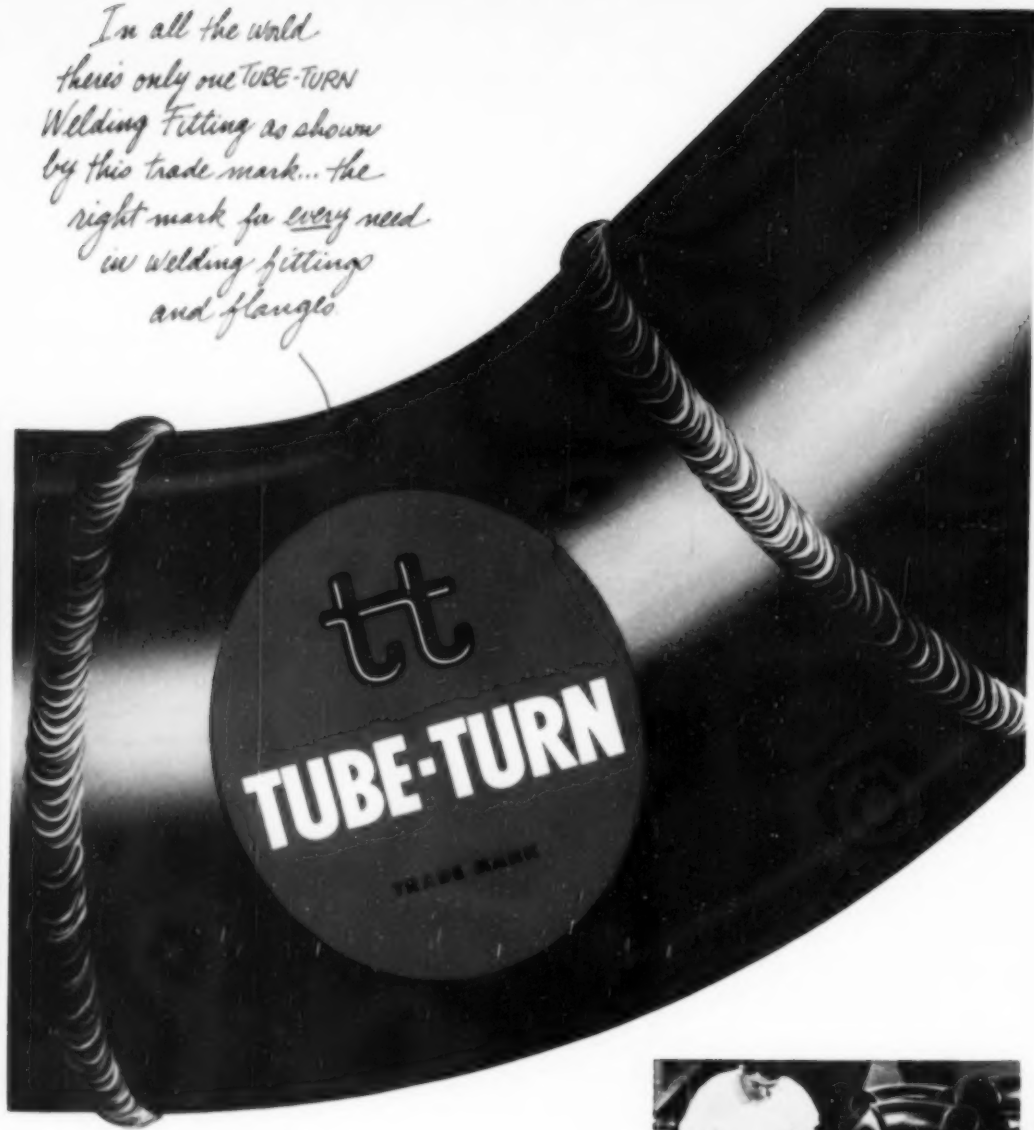


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Mail one of the postcards at right. Before mailing, circle page numbers of items about which you want more details. Then write your name and address on other side of card and mail to us. Your requests will be forwarded to companies concerned, the answer coming direct to you.

## TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are three indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised; (3) advertisers.

## NUMBERS EXPLAINED

Advertisements.—There is a page number on the postcard for each advertisement. Before the number may appear, L, R, T, B (left, right, top, bottom) locating the ad on the page; small letters following (a, b, c) indicate additional products in the advertisement.

Editorial Items.—Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in three editorial departments: Equipment News, New Products, and New Literature.

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100-20	31	200	94-95	176H	2220	913	240

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### Shell Making Benzene for the West

Shell Oil Co., at its Wilmington, Calif., refinery has begun full-scale production of synthetic benzene from petroleum raw materials. The company decided to manufacture benzene there as a result of the favorable market resulting from increasing demands for benzene as a raw material for the production of phenol, aniline, alkyl aryl sulphamate detergents, and particularly polystyrene. The major uses for benzene on the Pacific Coast include production of styrene, detergents and solvents.

The company expects that the demand for benzene will justify its continued output of the product at Wilmington for at least the rest of 1950. On an experimental basis the company produced 14,000 bbl. of benzene in the spring of 1947.

Shell is manufacturing benzene in its Wilmington refinery by a series of steps including catalytic isomerization of methyl pentanes to cyclohexane; dehydrogenation of cyclohexane to benzene; and extractive distillation of liquid products from the dehydrogenation step to separate the benzene from other components. Fundamentally, the procedure is essentially like that used by Shell during the last war for the production of toluene. In the benzene operation, small amounts of special solvents are recovered as byproducts.

Fresh feed material for benzene production at Wilmington is a straight-run naphtha with a boiling range from pentanes to 350 deg. F. end point. Benzene yield averages 4 percent by volume of the plant feed, of which the natural benzene content is about 0.5 volume percent.

As to purity, the benzene meets all specifications for Barrett D-2 commercially pure benzene, and is over 97 percent pure as determined by melting point, and averages only 0.001 percent sulphur content by weight.

### American Lignite Makes Montan Again

American Lignite Products Co., Ione, Calif., the only commercial producer of montan wax in the United States, is back in full production again after the fire that destroyed a part of the plant late last year. Germany is the only other supplier of this wax, a product that is

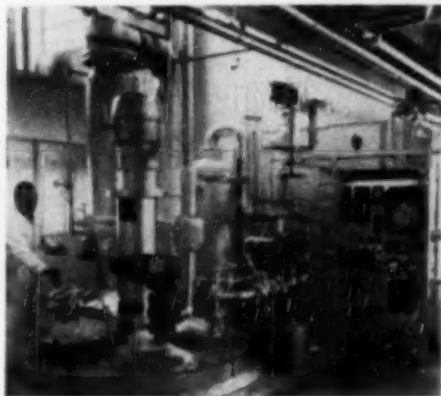
solvent-extracted from certain types of lignite and used in the manufacture of floor waxes, carbon paper, shoe polishes, etc.

Parts of the plant had to be rebuilt. The whole extraction plant has been replaced, and incorporates some improvements over the former system. The company, a division of the De Angelis Coal Co., Carbondale, Pa., plans to introduce soon new types of waxes derived from the basic commodity.

In addition to the wax, Sap Brown, a pigment, is being produced, but the production of byproduct fuel briquettes has been discontinued.

The plant began operations early in 1948. Since the fire no basic change in the process has been made. Lignite obtained in the vicinity of Ione is crushed and subjected to a series of solvent extractions leading to the production of wax.

Raymond L. Drew is technical director at the plant.



Reactor top and controls.

### General Paint Moves Into Alkyds

General Paint Corp., one of the major paint and varnish manufacturers of the West, has completed and put into operation at its San Francisco headquarters a new \$250,000 unit for the production of alkyd resin. Resin manufacture is a new venture for the company, and will supply requirements not only for General's San Francisco plant but also for its factories at Los Angeles, Spokane, Seattle and Portland.

A year or so ago, the company recognized that alkyds were rapidly gaining in the protective coating field. The company decided to get into alkyd production not only to assure its western plants of a continuing adequate supply but also to maintain the quality of supply. In its entirety the new plant is a modern installation for the manufacture both of alkyd resin and varnishes.

With respect to capacity, the plant, on the basis of 24-hr. operation, can produce a minimum of about 3,000 gal. of resin. Designer and general contractor was Pacific Coast Engineering Co., Alameda, Calif.

The plant has some noteworthy aspects. From the general standpoint, emphasis is laid on labor-saving arrangements. Normally, only two men per shift are on duty. This results from an economy of space and time made possible by a compact arrangement of equipment and a high degree of instrumentation. Automatic control is maintained over temperatures and heating rates. A feature of the entire plant is that if pre-determined operating conditions should fail because of individual failures in equipment, alarms will sound.

The 1,000-gal. stainless steel reactor vessel is heated by six tangential natural gas burners. A stainless steel coil arranged around the inside wall of the vessel is fitted for service with cold water which is introduced automatically to maintain the desired temperature in the vessel.

After the cooking period, a batch from the reactor is pumped to the thin-down tanks. Each of these two stainless-steel chambers has a capacity of 2,500 gal., and is fitted with a stainless steel coil through which either cooling water or steam can be passed. In these tanks, a thinning solvent is added, and the contents are agitated and ultimately discharged through a frame filter, then adjusted to viscosity and total solids requirements.

Inert gas for blanketing reactor, thin-down tanks and finished product in storage is provided by burning natural gas to carbon dioxide and nitrogen. The scrubbed combustion products are then compressed to 150 psi. and stored in a pressure vessel.

Technical supervisors at the San Francisco plant include Charles Buchzik, plant engineer; Arthur Cramer, chief chemist; and August Engle, varnish superintendent.



### Hydrogen Sulphide on Wheels

Earlier this spring, PPI reported that equipment has been installed in the refineries of Union Oil Co. and Wilshire Oil Co. at Los Angeles to remove hydrogen sulphide from refinery gases and transport the material in monoethanolamine solution by tank truck to General Chemical Co. for conversion of the gas into sulphuric acid. This kind of trucking operation may possibly be found feasible elsewhere; hence some information about the type of truck used, the daily schedule and precautions employed, should be of interest.

**The Truck**—Just now, one 4,200 gal. specially built truck, owned and operated by Allyn Tank Lines, Inc., covers the 18 mi. run from Union Oil to General Chemical and the 30-mi. run between Wilshire Oil and General Chemical. Another truck may be added later.

As to construction of the tank truck, the tank of which is 29 ft. long and 5 ft. in diameter, the thickness of the mild steel used in the shell and the heads is, respectively,  $\frac{3}{8}$  in. and  $\frac{1}{2}$  in. Heavy construction was used to minimize losses of contents in accidents. Vapor pressure of the rich solution is substantially atmospheric under normal conditions, but a vapor relief valve is set to pop

at 60 psi., which is the maximum discharge pressure of the filling pumps at the refineries. A Liquidometer gage with high and low audible warnings is installed in a recessed well in the rear head of the truck. Loading and unloading is done through a flexible hose.

**The Schedule**—On a 24-hr. operation basis, at the start of schedule, the truck hauls "rich" solution from Union to General and there discharges it and takes on a cargo of "lean" (hydrogen sulphide-free) solvent; then delivers the lean solvent to Wilshire and there loads rich solution; then carries the rich solution to General, discharges it and picks up lean solvent to carry back to Union. Because Wilshire's production of hydrogen sulphide is relatively small, the remainder of the 24-hr. schedule calls for four direct round trips between Union and General Chemical.

**The Precautions**—Los Angeles Health Department has issued a pamphlet of instructions for employees of the companies and trucking line involved. This covers in detail the chemical compositions of the lean solvent and rich solution, their relative characteristics with respect to flammability and toxicity, and precautions to be taken in case of mishaps during transportation.

### Newsprint Mill for Colorado

Intentions to build a pulp and newsprint mill in western Colorado have been disclosed by Columbine Development Co., a new firm headed by Preston Walker as president. [Walker is also manager of the Grand Junction (Colo.) Sentinel.] The project, according to Walker, will cost about \$20 million. Elbasco Services, Inc., New York City, has been selected as engineering design and construction consultant.

Walker says that "The ownership of the company is entirely in the hands of residents of western Colorado. The company was organized for about three main purposes: (1) to use beetle-killed spruce timber (2) to use Colorado river water for industrial purposes, and (3) to furnish this section of the region with an industry."

Site for the mill will probably be some locality between Glenwood Springs and Rifle. Construction is scheduled to begin in a month or two. The capacity is unofficially reported as 200 tons per day.

Earlier this year the company was successful bidder at a Forest Service auction sale in Washington, D. C., for 4.5 million acres of Colorado timber. Most of the timber is beetle-killed Engelmann spruce, and lies principally in the White River National Forest.

### Filtrol May Build Utah Plant

Filtrol Corp., manufacturer of petroleum cracking catalysts, adsorbents and filtering materials at Los Angeles, is likely to build a new \$2.5 million plant in the vicinity of Salt Lake City to process halloysite, a hydrous aluminum silicate which the company has been bringing to Los Angeles. In January it was learned that shipments of the material to Los Angeles averaged nine 50-ton cars per week.

Last month, Filtrol officials were in Salt Lake City, where W. W. Gary, president, emphasized that the company's board had not reached a decision at that time. Other possible plant sites at Eureka, Utah, or Henderson, Nev., were being considered. However, bids were invited from contractors in the Salt Lake City region, where the company is reported interested in a site at the Industrial Center—the war-built Remington Arms plant.

Eureka, rather than the petroleum refining center at

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Salt Lake City, would have an advantage stemming from the fact that Filtrol would have close at hand the halloysite clay mined near Eureka by Dragon Consolidated Mining Co., subsidiary of International Smelting & Refining Co. Clay reserves have been estimated at 500,000 tons.

Filtrol has been buying halloysite from Dragon for over a year. The Dragon deposit has been known for a number of years, but until Filtrol began using it, production was relatively small. It has been used in manufacture of brick, and during the war it was used by Ford Motor Co. of Canada in making molds for centrifugal castings.

A Filtrol plant in Utah would probably constitute a new outlet for sulphuric acid made in the region, since Filtrol has been converting halloysite into activated clay at Los Angeles.

### New Firm Plans for Canadian Gas

Betting that natural gas from western Canada will be piped down into Washington within the next three to five years a new firm, Trans-Northwest Gas, Inc., has been organized at Spokane to furnish distribution of the fuel within the state. Directors include Paul H. Graves, well known Spokane attorney; Moritz Milburn, president of Centennial Flouring Mills, Seattle; and R. H. Hamill, of the New York engineering firm of Sanderson & Porter.

The company would construct laterals from the main transmission lines to connect with facilities of local gas distributing companies.

Graves said the company is prepared to be "the primary voice emphasizing to the provincial government in Alberta, and to the transmission companies presently competing for the opportunity to bring natural gas from Alberta, that gas must be delivered to us at a price competitive with California and the eastern and midwestern markets now receiving gas from Texas and other fields."

Engineers of the Washington state public service commission have reported to the governor that natural gas piped into Washington in a 26-in. line would produce about 32 percent more energy than will Grand Coulee dam when the dam finally reaches full capacity with 18 generators in operation. The public service commission has adopted rules governing importation of Canadian gas.

### Combined Metals Plans for Henderson

Combined Metals Reduction Co. has disclosed the broad outlines of its program involving use of properties leased this year at the former Basic Magnesium plant, Henderson, Nev., from Nevada Colorado River commission.

President and General Manager E. H. Snyder says that the company will move in at Henderson just as soon as plans for the new plant are completed, and that construction will definitely begin some time in 1951. Total

price of the lease and option for Combined Metals is \$970,000. The company has been allotted 75 million kwh. per year for its operations at Pioche and Henderson, and the Lincoln county power district will furnish a part of this out of its 80 million kwh. allotment.

Combined Metals plans to use the equipment at Henderson in a new process for handling oxidized ores containing lead, zinc and manganese. The ores would be initially processed at the present Pioche properties of the company and carried to Henderson. There it is planned that the end products will be lead, zinc and manganese, with possibility that salts of one or more of these metals will be manufactured.

Otto Herres, vice president of Combined Metals, confirms the fact that efforts to find a practical method of handling oxidized ores are not new. He points out that Mr. Snyder cooperated in the preparation of a U. S. Bureau of Mines report, "Innovations in the Metallurgy of Lead," issued in 1918. Herres now says that major problems facing the process have been overcome, in part due to terms on which electrical power is available at Henderson.

Officials of Combined Metals would not comment, last month, on reports that operations of their company will be linked in some degree to plans of National Lead Co., which has also leased BMI property at Henderson.



### Lever's Colossus Rises Fast

Three months ago construction at the Los Angeles site of the \$25 million Lever Brothers soap and food products plant amounted to little more than grading and the assembling of materials. Today there is every indication that the gigantic project, for which Bechtel Corp. is engineer and general contractor, will be completed on schedule near the end of this year.

Last month, steel had been completely erected for the soap processing building and the soapery, 16 tanks (combined capacity 8 million lb.) erected on the soapery tank farm, 12 tanks (total capacity 18 million lb.) built on the edible products tank farm.

## NAMES IN THE WEST

W. K. Evans, Jr., formerly assistant manager, fuel oil, for Shell Oil Co.'s San Francisco office, has been promoted to the company's San Francisco district managership.

Robert P. Logan has become resident engineer in the Pacific Northwest for National Council for Stream Improvement, with headquarters at Portland. He is the council's first representative in the region, and was chosen last December following

a consultation of council members and Northwest pulp and paper makers. He is collecting data on pulp mill effluents into streams.

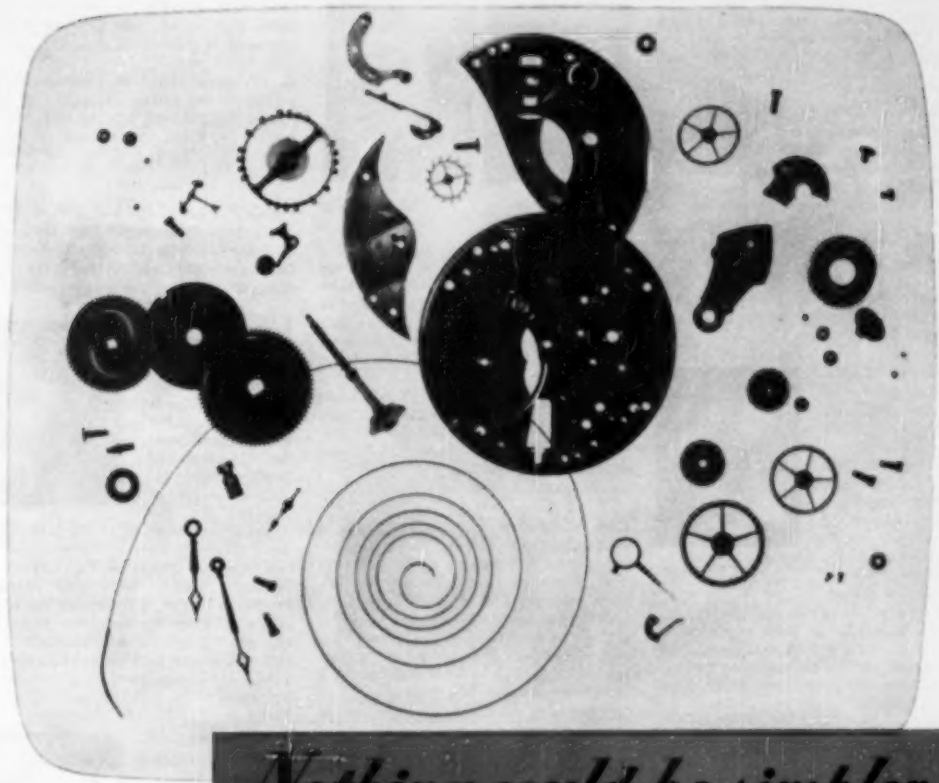
John McEwan, technical director of the Everett mill, Pulp division, Weyerhaeuser Timber Co. has become chairman of the acid sulphate pulping committee of TAPPI. He replaces George McGregor, Minnesota & Ontario Paper Co., who asked to resign. Dr. McEwan is a chemi-

cal engineering graduate of Ohio State college, and obtained his Ph.D. from Institute of Paper Chemistry in 1947. He joined Weyerhaeuser the same year as research group leader.

J. D. Sterling has been elected president of Sunset Oil Co., Los Angeles.

Fred C. Schlemmer, manager of operations of the Hanford plutonium production center for Atomic Energy Commission, has resigned. He will return to private industry, and says that he will be associated with an engineering construc-





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tion firm in New York City. During 1933-1946 he was a member of TVA on hydroelectric and steam power construction.

Stuart Parry Walsh, who heads the San Francisco consulting firm of Industrial Survey Associates, has become director of the newly established Bureau of Research at University of Santa Clara, Santa Clara, Calif. Industrial Survey Associates is a firm specializing in economic and industrial surveys for municipalities and corporations.

Raymond B. Giles has been named development director for Pacific Coast Engineering Co.

Arthur O. Karlen has been appointed manager of the Coos Bay branch of Weyerhaeuser Timber Co. in Oregon. He has been assistant manager of the company's Longview branch since January, 1948. He was previously manager of Springfield Plywood Corp. at Springfield, Ore., for two years. Before going to Springfield he was connected with the engineering department of Weyerhaeuser at Tacoma. He assumes complete charge of the Coos Bay operations.



A. O. Karlen



S. L. Brown



C. C. Chaffer

Stephen L. Brown is being transferred this month by Monsanto Chemical Co. from Seattle to Santa Clara, Calif., where he will become superintendent in charge of resin manufacturing at the plant which the company is building there. Carroll C. Chaffer, who has been superintendent of Monsanto's coatings plant at Los Angeles, is assuming the same duties at Santa Clara. Brown, a graduate of University of Washington and University of Arizona, joined in 1942 the I. F. Laucks Co., now the Western Division of Monsanto. Chaffer joined Laucks in 1926.

John T. Brewster, formerly in charge of oil transportation for Richmond Exploration Co. at San Francisco, has been appointed assistant superintendent of Salt Lake Refining Co. at Salt Lake City. Brewster, a mechanical engineering graduate of the University of California, was with Richmond Petroleum Co. of Columbia from 1939 to 1942. Following a period of war service he served with Standard Oil Co. of California affiliates in Venezuela.

Raymond A. Sahn has become executive vice president of India Paint and Lacquer Co., Los Angeles, as successor to the late W. W. Seaman. He joined the company in 1934 and has remained with it continuously except for a period of war service. He became sales manager in 1940. Coming to California in 1930 he founded the Sahn Industrial Arts Co. In his new position he will direct sales and development of new products.

William J. Howell, Jr., formerly with Shell Chemical Corp. at Los Angeles, is now assistant to the vice president in charge of development, University of Chicago.

Edgar H. Lloyd has become president of Pacific Tube Co., manufacturer of stainless and carbon tubing at Los Angeles. He became superintendent in 1943 and has been vice president in charge of operations for the last two years.

Ralph De Moisy has become technical director of Washington State Institute of Forest Products. He replaces O. H. Schrader, who has become managing director of the Douglas Fir Plywood Association at Tacoma. De Moisy was formerly assistant professor of forest engineering at Oregon State College.

W. A. Cotton has been transferred by Masonite Corp. from the firm's plant at Laurel, Miss., to Ukiah, Calif., to become

production manager of Masonite's new plant there. He was formerly superintendent of production at Laurel.

G. W. Govier is the new chairman of the petroleum and natural gas section of Canadian Institute of Mining and Metallurgy. Dr. Govier is professor of petroleum engineering at University of Alberta at Edmonton.

Claude P. Heiner, who had been president and general manager of Utah Fuel Co. until the coal firm was bought last month by Kaiser Steel Co., has been retained as management consultant to the firm.

James H. Curtis has been named manager of manufacturing for General Petroleum Corp. This is the second promotion for Curtis in 14 months, who became manager of refineries for the company in February. Previously he had been in charge of the refinery at Torrance, Calif. He joined General Petroleum in 1942 after leaving the Lummus Co., where he had been a process engineer. Curtis became assistant manager at Torrance in 1944 and manager in 1945. He is a graduate of University of Michigan.



J. H. Curtis

S. L. Gidley has become northern district manager of Pabco Paint division, Paraffine Cos., Inc., and has been transferred to his new position at Portland. He replaces Clay Liljeston, who has been transferred from Portland to Los Angeles to become district manager in the Building Materials division. Gidley was previously sales promotion manager in the San Francisco office of Paraffine Cos. He joined the firm about a year ago.



S. L. Gidley

W. F. Boyer, Sr., has been named sales manager of the foil division for Kaiser Aluminum & Chemical Sales, Inc. He was formerly division manager of the New England area and Washington, D. C., for Reynolds Metals Co.

Lawson F. Turcotte, executive vice president of Puget Sound Pulp & Timber Co., Bellingham, Wash., has been elected president. He succeeds Fred G. Stevenot of San Francisco, who becomes chairman of the board.

Robert U. Haslanger, who has been assistant general manager of Monsanto Chemical Co.'s Western Division at Seattle, has been transferred to Monsanto's Texas Division to assume charge of sales development.

8

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## **FIRMS IN THE WEST**

**Western Plywood Co.** has begun construction of its \$180,000 veneer plant at Quesnel, B. C., and plans to begin production late this year.

**National Technical Laboratories**, South Pasadena, Calif., maker of Beckman Instruments, has changed its name to Beckman Instruments, Inc.

**Arizona Portland Cement Co.** is a subsidiary of California Portland Cement Co. rather than of Calaveras Cement Co., as was said in *PPI*, April, p. 47.

**Pacific Powder Co.** has completed at its explosives plant at Tenino, Wash., a \$100,000 addition consisting principally of a nitrating unit. The plant has been producing annually 6 to 8 million lb. of explosives.

**Consolidated Mining and Smelting Co. of Canada, Ltd.**, will spend over \$1 million to modernize and enlarge the water supply system for the firm's chemical and metallurgical installations at Trail, B. C., where 50 million gal. of Columbia river water per day is used.



For cleansers.

**Economics Laboratory, Inc.**, St. Paul, Minn., has bought a new plant at Santa Clara, Calif., for production of industrial and household cleansers. This is the first western operation established by the company, which has heretofore been shipping such products from its plants at Chicago, Ill., and Lyndhurst, N. J.


**International Minerals & Chemical Corp.** expects to spend 1.5 million dollars over the next two years in the construction of a connecting shaft for transportation of men and equipment at Carlsbad, New Mex.

**Japanese Overseas Agency** is the name of a new organization established in San Francisco to promote trade between Japan and the United States. Head of the new organization, which was promoted by the San Francisco Chamber of Commerce, is Atsushi Uyama.


**Panco Manufacturing Co.** has established a new plant at Santa Clara, Calif., for the manufacture of cosmetics and polishes for national distribution.

**Alexander Film Co.** has withdrawn from the business of manufacturing perlite and is offering for sale the perlite processing

CHEMICAL ENGINEERING—June 1950




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equipment of the company's McKittrick Engineering Division at Colorado Springs, Colo. The company had recently purchased a building at Florence, Colo., for its perite operations.

Hathaway Allied Products Co. is expanding its milling facilities in Los Angeles. The firm is an importer and miller of gums and crude botanical drugs and allied products.

U. S. Geynum Co. has leased a new building in Los Angeles as a site for its western sales office. Ralph Peters is sales manager of the Pacific division.

Utah Oil Refining Co. has announced a \$955,000 construction program, which

includes a \$30,000 laboratory at the firm's Salt Lake City refinery and completion of a \$225,000 asphalt blending plant.

General Tire & Rubber Co. is constructing a \$500,000 building that will house the company's offices for the southern California branch at Los Angeles.

Washington Hardboard Products, Inc., Seattle, is a new firm organized to manufacture hardboard from wood waste. The company has an option on a site at Tacoma. President is Norman C. Aaron; vice president and general manager is Gordon B. Lynch.

National Lead Co. has moved the offices of its Northwestern Division Pacific Coast

branch from Portland to Seattle, where W. C. Minsinger is division manager.

Blue Cross Products Inc. is a new firm at Phoenix, Ariz., organized to manufacture pest control products.

International Minerals & Chemical Corp. has named E. L. Roberts Co. in San Francisco to handle sales of monosodium glutamate.

Jack Stiehl Co., Berkeley, Calif., manufacturers representative for engineering equipment used in the chemical, food and allied processes, has changed its name to Stiehl & Co.

Kaiser Steel Corp., producer of byproduct coke oven chemicals at Fontana, Calif., has acquired ownership and operation of Utah Fuel Co., for \$6.8-million.

Consolidated Mining and Smelting Co. has begun to install a new \$365,000 Oslo crystallizer in the firm's chemical plant at Trail, B. C. The equipment will be the fifth crystallizer installed at the ammonium sulphate plant, and will permit increased production.

Nopco Chemical Co., manufacturer of pharmaceuticals and industrial chemicals, has formed a new Pacific division to handle the firm's business for the 11 Western States and British Columbia.

California Zonolite Co., Sacramento, is completing a plant to manufacture acoustical plastic, high temperature cement and insulating materials.

Pan American Chemicals Corp., subsidiary of U. S. Chemicals Corp., has begun the production of chemical preservatives for washable materials at Los Angeles.

Gamlen Chemical Co., manufacturer of soap, boiler compounds and industrial solvents, has purchased a site and buildings for a new and enlarged plant in South San Francisco from United Air Lines.

Los Angeles Paint, Varnish and Lacquer Association has sponsored installation of a Gardner adhesionometer at Occidental college for the making of tests of the qualities of paints and varnishes. Results of the work will be made available to all paint manufacturers.



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When you want something extra special in chemicals—such as early delivery, modified strength, unusual packaging—its good to be able to discuss your problem with the man who can set the wheels in motion. Here at the Stauffer Chemical Company you deal with the man who can get things done...when you want them done.

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SEE PAGE 372-373

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A single item or a Complete Plant  
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JUNE  
1950

VOL. 57  
NO. 6

# Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

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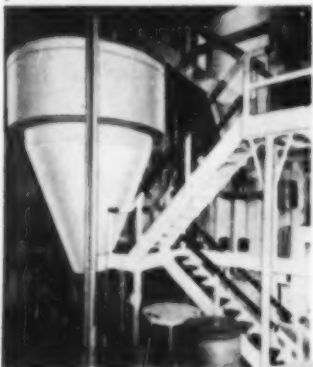
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down the sewer?



Swenson multiple-effect forced-circulation Evaporators used in recovery of organic materials

Swenson Spray Dryer used in the manufacture of pharmaceutical products from process wastes



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WHEEL OVERFLOW  
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SAMPLE  
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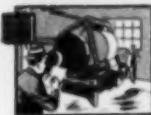
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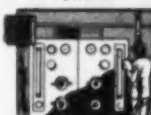
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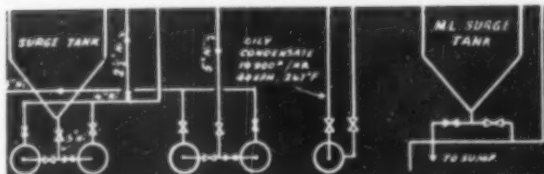
Manufacture of Equipment



Test Operation



Periodic Check-Ups



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HARVEY, ILL., U.S.A.

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	MATERIAL BALANCE
Chd. F.M.	Capacity
Scale 1/4" = 0.01 ft.	For
Appr.	U-2235
Appr.	



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### Quick Facts

- 1 Protects against:
  - Nuisance and pneumoconiosis-producing dusts
  - Toxic dusts
  - Combination of all dusts (by cartridge or filter)
  - Low concentrations of light organic gases
  - Low concentrations of acid gases
  - Low concentrations of combined acid and organic gases
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- 2 Newly designed lightweight chemical cartridges of non-sparking aluminum have increased capacity, can withstand rough handling and moisture.
- 3 All dust cartridges have Bureau of Mines Approval.

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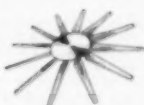
#### ★ OPEN DISTRIBUTION SYSTEM

Double-Flows always operate at top efficiency because the water distribution system is available. Water flow to each cell is easily regulated . . . cleaning, a matter of minutes.



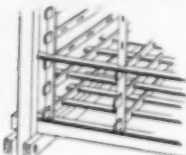
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**CASH STANDARD**  
*Streamlined*  
TYPE 1000  
**REDUCING VALVES**



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**Shows why users check with these points and how you can realize them.**

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4. Smooth operation.
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7. Elimination of failures.
8. Cost-saving operation.
9. No spillage.
10. Practically zero in maintenance.

**BULLETINS  
 AVAILABLE  
 ON OTHER  
 CASH STANDARD  
 VALVES**

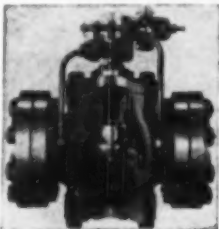
*Send for them*



Bulletin 956—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valve for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air, with any gas or oil that is non-corrosive and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

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**VALVES**

**A. W. CASH COMPANY**  
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The Bird-Young Universal Continuous Vacuum "Thin Cakes" Filter



The Bird Suspended Centrifugal



The Bird Classifier for wet separation by particle size

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RESEARCH  
AND  
DEVELOPMENT  
CENTER

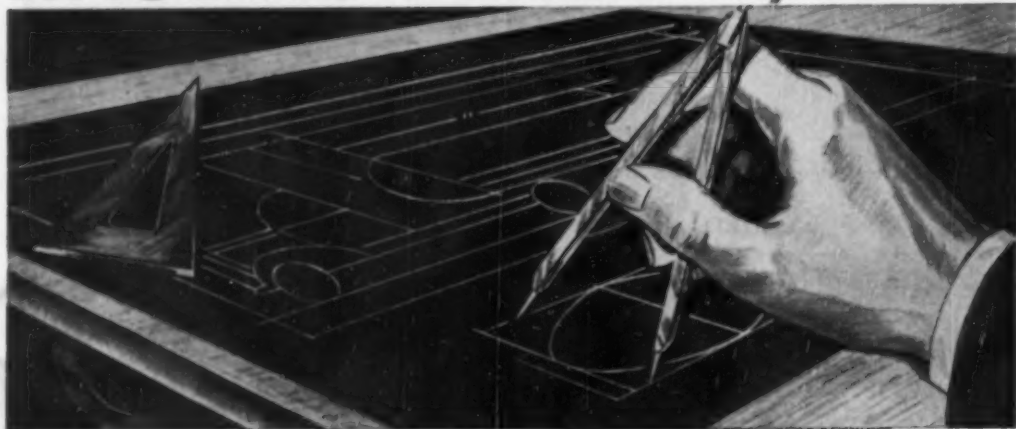


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SULPHURIC ACID TANK-TRAILER with 2200-gallon carrying capacity. Equipped with tandem-axle Torsion Suspension.



ACID TANK TRAILER with 1900-gallon carrying capacity.



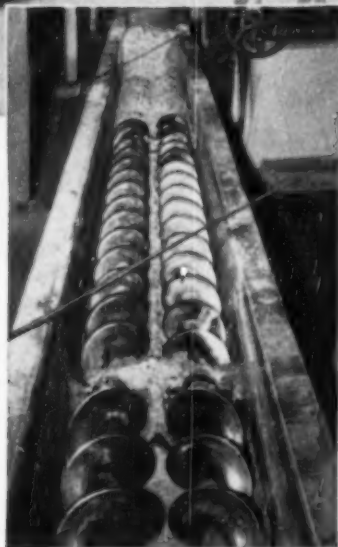
CAUSTIC SODA TANK-TRAILER with 2800-gallon carrying capacity. Equipped with exclusive single-axle "Multi-Rate" Spring Suspension.



ASPHALT TANK-TRAILER with 4000-gallon carrying capacity. Equipped with tandem-axle Torsion Suspension.

**FRUEHAUF**  
*Trailers*

WORLD'S LARGEST BUILDERS OF TANK-TRAILERS



Top illustration: Sulphur is reclaimed from the storage bins by Link-Belt tapered screw feeder which discharges to Link-Belt 72' long screw conveyor for delivery to melting pit. Lower illustration: Twin 9" diameter Link-Belt Helicoid (screw) Conveyor handling wet pulp from filter to bleach chest.

#### LINK-BELT COMPANY

Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities.

Link-Belt originated and is the largest producer of continuous rolled Helicoid (screw) conveyor. Link-Belt also manufactures many other types of screw conveyors, including sectional flight, in a wide range of diameters and gauges, and in various metals, including stainless steel for conveying jobs where a sanitary metal is desirable. All necessary components such as collars, couplings, hangers, troughs, box ends, flanges, thrusts, drives, etc., are also available to give you one source of supply.

Link-Belt screw conveyors are compact, occupying less space than many other types of conveyors and therefore can be adapted to close clearance locations. Loading is simple—thru spouts or from adjacent conveying mediums. Covers and joints are tight, and dust seals and spring cover clamps keep dirt out, dust inside. Installation and operating costs are low.

Link-Belt engineers will be pleased to study your conveying problem and recommend a conveyor to suit your specific needs. Contact our nearest office for unbiased recommendations.

11,078

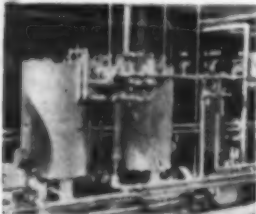




**I**F the compressed air in your instrument lines and process-control lines holds moisture, rust or oil, you're in trouble. Instrument readings can go haywire . . . air-line valves can stick . . . controls can go entirely "off the beam" . . . the whole shootin' match can literally blow up!

Isn't it silly to install an elaborate remote process control system and then not keep the pressure air *clean* and *DRY*? Dry air can't freeze . . . can't form rust.

It is so easy to keep the air dry, clean and oil-free with ALCOA Activated Alumina. This reliable desiccant effectively prevents moisture and oil from entering the system.



Courtesy of  
Standard Oil & Gas Company

The photograph illustrates a typical unit used for maintaining process-control-line air in proper condition. Air is dried by being passed through beds of ALCOA Activated Alumina, alternately, in the two towers at the left. At the right

is an oil filter—also charged with ALCOA Activated Alumina—which cleans the air of oil and suspended impurities that may enter system from the compressors. This thorough conditioning of the air helps insure the efficiency of process-control systems . . . reduces maintenance and operating hazards. (This type of equipment also is used for industrial compressed air and paint-spray systems.)

**DON'T FORGET** the convenience and economy of ALCOA Aluminum instrument air-line tubing in long lengths.



Let us send you the booklet:  
"ACTIVATED ALUMINA—Its Properties and Uses"



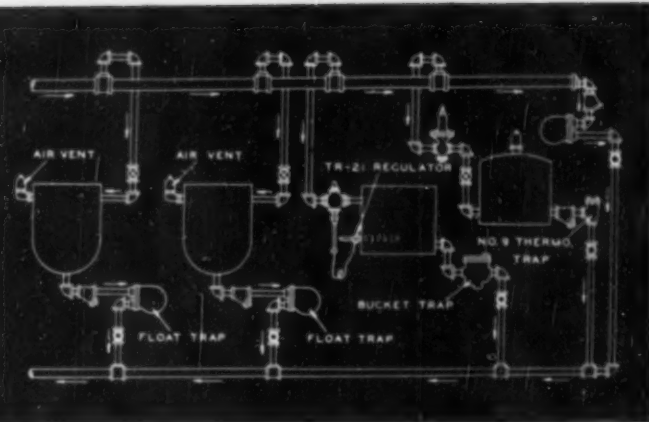
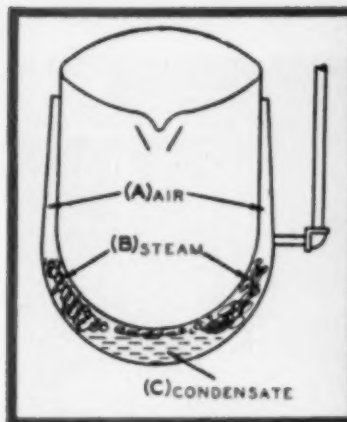
This 5½" x 8¼", 48-page illustrated booklet gives the properties of ALCOA Activated Alumina and describes many of its applications. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 602½ Gulf Building, Pittsburgh 19, Pennsylvania.

# Alcoa Chemicals



**ALUMINAS and FLUORIDES**

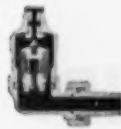
ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS  
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOROBoric ACID • CRYOLITE • GALLIUM



# GOOD STEAM PRACTICE

## *Simple as A B C*

**A.** Air and other gases in steam lines or equipment not only reduce the effective temperature of the steam, but create insulated cold spots wherever there is an accumulation. These gases are constantly generated in the boiler and air is always present when starting up. Ask for Bulletin No. 275 (Air in Steam).



**B.** Dry steam can be delivered at the point of use only by trapping condensate from mains, risers, coils, etc. The amount of steam and therefore the temperature of the room, process, press, tank or oven, can be controlled to within a degree or two by selecting suitable Sarco Temperature Controls.



**C.** The speed of the work can be maintained and fuel efficiency insured at top level by removing condensate with the right Sarco Steam Trap based on calculations and recommendations given in Sarco Bulletin No. 1600.



No. 9      FLOAT THERMOSTATIC      BUCKET

ASK THE SARCO MAN TO APPLY "ABC" TO YOUR PLANT

235

**SARCO**  
SAVES STEAM

**SARCO COMPANY, INC.**

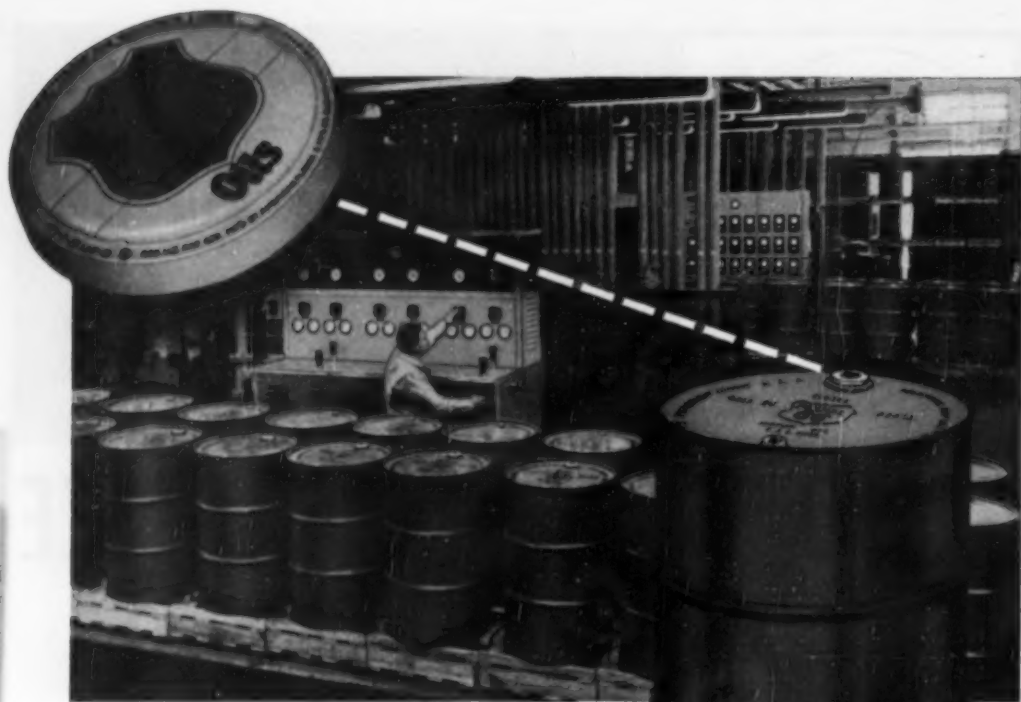
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SARCO CANADA, LTD., TORONTO 8, ONTARIO

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**P**HILLIPS 66<sup>®</sup> has built its reputation for quality by using selected lube-type crude oil . . . the most painstaking processing and blending . . . and by protecting that quality with Tri-Sure Closures\* on every drum.

Phillips Petroleum Company has consistently used Tri-Sure protection since 1932. Its experience has proved that Tri-Sure Closures give positive assurance that every gallon will be

delivered . . . its quality safeguarded from seepage and substitution . . . its full value secure from leakage and pilferage.

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\*The "Tri-Sure" Trademark is a mark of reliability backed by 27 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

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**TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA**



As versatile a performer as stainless steel is, the application of each member of this family of alloys must be carefully planned. Pioneers in the development of these specialty steels, Crucible knows that unless the *right* analysis is used, stainless may prove disappointing. That's why Crucible offers you the services of an alert staff of metallurgists and engineers to help you apply stainless . . . properly. These engineers and metallurgists have all the wealth of experience that Crucible's half century of specialty steel leadership provides . . . take full advantage of it.

Whatever your stainless application may be, Crucible is prepared to help you. Whether the order is in pounds or tons, Crucible tackles every industry-posed problem with a keen devotion to detail. If you're thinking of stainless . . . call in Crucible. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

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first name in special purpose steels

## STAINLESS STEELS

*fifty years of* Fine *steelmaking*

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

CHEMICAL ENGINEERING—June 1950

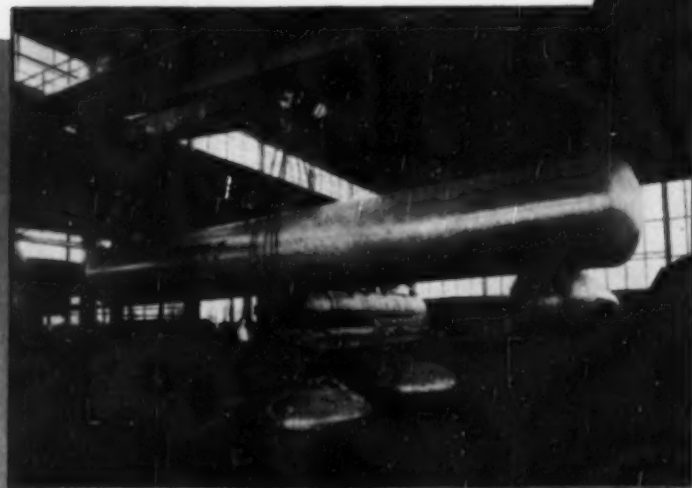
**FIND OUT HOW POSEY  
"stacks up" ON YOUR STACK JOBS**

- *for* **GUARANTEED construction**
- *for* **price SAVINGS**

When your stacks are fabricated at the Posey Iron Works, price isn't "upped" to allow for hesitations in the engineering department . . . false moves in the shop. Since 1910, Posey Iron has constructed steel tanks and stacks in capacities and sizes up to maximum.

Forty years of experience . . . accumulated case histories over the same period . . . permit Posey Iron to design and construct with a sureness that often cuts dollars from the estimate. Stack performance is frequently guaranteed. Posey is equipped to do the complete job . . . from design to fabrication to erection.

It pays to find out how Posey "stacks up" on stack jobs. Write today for free bulletin.



This 50-ton crane (27-foot headroom) allows quick, easy handling of sizeable units like this butane tank. Addition of equipment like this has been a feature of Posey Iron Works production expansion.

Established 1910

**POSEY IRON WORKS, INC.**

**STEEL PLATE DIVISION**

*formerly LANCASTER IRON WORKS, INC.*

**LANCASTER, PA.**

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PLATE FABRICATION

DIVISIONS  
BRICK MACHINERY  
FOUNDRY • INDUSTRIAL  
HEATING • IROQUOIS  
SHIPBUILDING  
STEEL PLATE

VESSEL DIVISION

# NEWS



## A.O. Smith

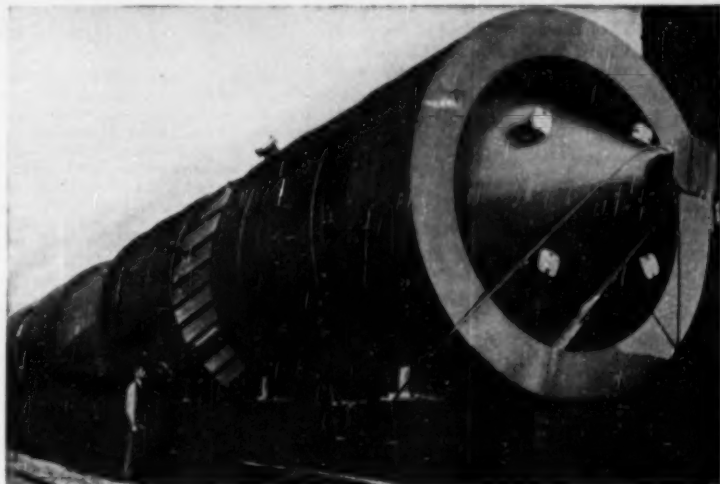
CORPORATION

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Los Angeles 14 • New York 17 • Philadelphia 3 • Pittsburgh 19  
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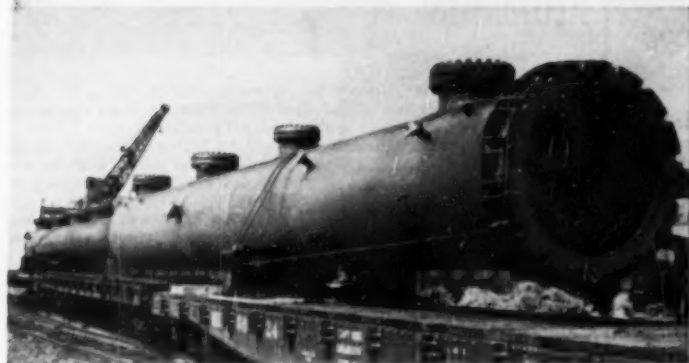


INTO EVERY SMITHlined FAT-SPLITTING TOWER, like the above 68-ft.-long SMITHway Tower, goes the experience and knowledge gained from a long and extensive program of research and development into the corrosion problems of the Fatty Acid Industry.

**THREADING A NEEDLE.** Getting a 12 ft. dia. by 43 ft. long paper mill replacement digester into an existing building is a difficult feat. A. O. Smith did it by shipping the SMITHlined Digesters in sections for final assembly and welding in place inside the paper mill.



**A. O. SMITH MAKES ALL TYPES OF OIL-REFINING PRESSURE VESSELS.** Here is one type, a SMITHlined Absorber Tower three railroad cars long (approximately 107 ft. long), leaving for a refinery in Ohio.



A. O. Smith Corporation, Dept. CE-690  
Milwaukee 1, Wisconsin

Without obligation, send us the latest A. O. Smith Vessel Bulletin:

- ☐ V-44: Field Assembly of Pressure Vessels
- ☐ V-46: Alloy, Alloy-lined, Clad, and Glass-lined Vessels
- ☐ V-52: Multi-Layer Vessel Manufacture and Assembly

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PUBLISHED BY THE ALUMINUM COMPANY OF AMERICA

## CUT TUBE COSTS AS MUCH AS 80%

Depending on the kind of tubes you now use, savings of 30%, 50% and even 80% are yours by switching to Alcoa Aluminum Heat Exchanger Tubes. These percentages are actual price comparisons . . . foot for foot, metal for metal at the retail level. If yours is an average-sized chemical plant, you can save about \$50,000 in a single year.

No trick to rolling-in ductile Alcoa Tubes. Standard tools and equipment are all you need. And you'll find aluminum's lightness eases handling and speeds fabrication.

Alcoa Tubes safely process hundreds of corrosive chemicals like furfural and formaldehyde. They protect purity in naval stores and vegetable oil processing and handling of similar products. They will not decompose unstable compounds like hydrogen peroxide. Alcoa Alclad Tubes successfully resist most cooling waters. They handle steam up to temperatures slightly above 400°F. And in sub-zero processes down to -320°F and lower, they increase in yield and tensile strengths, show no signs of embrittlement.

For complete information about Alcoa Tubes and the name of your nearest supplier, call your local Alcoa sales office. Or write ALUMINUM COMPANY OF AMERICA, 1490F Gulf Building, Pittsburgh 19, Pennsylvania.

\* \* \*

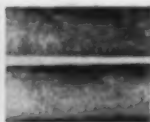


**ALUMINUM COMPANY  
OFFERS NEW BOOK**

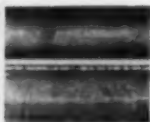
This new, 24-page booklet will answer many of your questions about Alcoa Tubes. It covers fabrication techniques . . . alloy selection . . . applications both chemical and petroleum. It describes tube cleaning, the use of inhibitors and methods of cathodic protection. It contains complete information on fluid flow and heat transfer characteristics, plus tables of physical properties and specification data. Write for your free copy, today. ALUMINUM COMPANY OF AMERICA, 1490F Gulf Building, Pittsburgh 19, Pennsylvania.



Steel tubes on one compressor intercooler rusted so badly in 5 years that they were replaced with Alcoa Alclad 35-H14 Tubes.



Steel tubes after 5 years' service.



Alcoa Tubes after 15 years' continuous service.

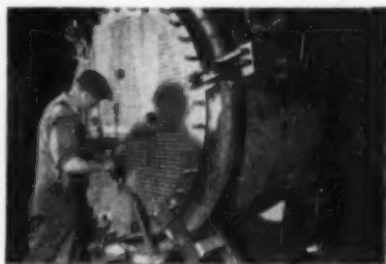
## ALCOA TUBES TRIPLE LIFE OF COMPRESSOR INTERCOOLERS

Two intercoolers used with Chicago Pneumatic air compressors were installed 15 years ago at the New Kensington Works of the Aluminum Company of America. One intercooler had steel tubes. The other had tubes of Alcoa Aluminum.

Inside of 5 years, the hot, moist compressed air had rusted the outer surfaces of the steel tubes badly. Much of the scale flaked off and clogged the valves. These steel tubes were replaced by Alclad 35-H14 Tubes, and no trouble has been encountered since.

The exchanger originally tubed with aluminum is still going strong. Outside surfaces are clean as the day they were installed. The inside surfaces show only minor pits after 15 years' continuous service.

## TUBING WITH ALCOA ALUMINUM



Aluminum tube sheets should be used wherever possible. For best corrosion resistance, use Alclad 4S-F Alloy Plate. For high operating pressures, use high tensile strength 61S-T6 Alloy Plate.

Existing commercial practices should be followed for tube hole spacing. Grooved tube holes afford tighter tube joints, but are not necessary. Standard tools and techniques are used for rolling-in Alcoa Tubes.

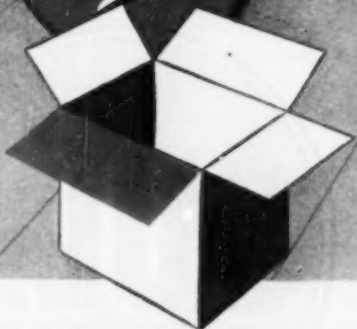
The use of steel tube sheets is satisfactory in many fresh cooling waters. If necessary, cathodic protection may be provided in the form of zinc strips or zinc metallizing of the tube sheets.

It is not recommended that aluminum tubes be used with copper, alloy tube sheets, because of galvanic corrosion which can occur.

Complete fabrication, installation and service information is contained in Alcoa's new booklet, "Alcoa Aluminum Heat Exchanger Tubes." Write for your free copy.



From Washing Machines  
to *Roses* . . . Gaylord  
Packages Nearly Everything



Yes, there are few manufactured products today that can't be packed for shipment in a Gaylord Box. The ingenuity of Gaylord's Engineering and Research Department, together with its broad experience, assures a sound, sensible solution to most packaging problems.

So it makes little difference what product you manufacture—the chances are that Gaylord can be of assistance. Just call the office nearest you.

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**CORRUGATED AND SOLID FIBRE BOXES** ●

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Developed by three years of research . . . and now refined by  
tens of millions of dollars' worth of new equipment!

# Gulf's *GREAT NEW* No-Nox

*DESIGNED FOR TODAY'S POWERFUL NEW ENGINES!*

Today's new cars have the most powerful engines ever made. AND—

*They require a super, anti-knock gasoline.*

Such a gasoline is the new No-Nox. It was especially designed by Gulf scientists—working hand-in-hand with leading automotive engineers—to give you maximum performance in your new car.

With a gasoline like this great new No-Nox, you can be sure your new car will perform at its brilliant best.

And the new No-Nox not only gives new cars peak performance. It also gives new life, new pep, and stops knocks in older cars too—even many with heavily carboned engines!

So no matter what model you drive, get a tankful of the new No-Nox today.

See for yourself what a difference it makes!

**Whisper-Quiet, Knock-Free Power!**

**Easy, Fast-Firing Starts!**

**Quick, Safe Passing!**

**Unexcelled Mileage!**

**Terrific Power in Every Drop!**



Good Gulf—our famous "regular" gasoline  
—is now better than ever, too!

Gulf Oil Corporation • Gulf Refining Company

*The Familiar Steel Courier becomes the Ambassador of Goodwill*



## NOW! COLOR PACKAGING FOR LARGEST STEEL SHIPPING CONTAINER!

**New RHEEMCOTE Process Produces  
First Completely Lithographed and Inner  
Roller-Coated 55-Gallon Steel Drum**

Color schemes, trademarks and designs, however intricate, may now be accurately reproduced on the biggest of all steel shipping containers.

Striking possibilities of the new, exclusive *Rheemcote* process, as shown above, are the result of years of Rheem research—and development of the world's largest metal-decorating press.

Remarkable for its merchandising value alone, the *Rheemcote* drum not only promotes—it protects!

A roller-coated lacquer lining seals the inner drum surface with glass-like purity... and thus opens the door to improved packaging for products which heretofore have

been difficult to contain. New electric "Resistance" welding produces smooth, strong seams, eliminates scale and burn-off metal. A hard, lustrous, exterior finish assures utmost durability against severe weather and handling.

Users of steel containers may at last achieve uniformity of packaging—and the opportunity to billboard their products and name before the eyes of the world!

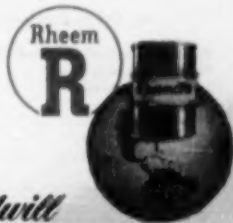
The Rheem Manufacturing Company, world's largest maker of steel shipping containers, is particularly proud to have developed the *Rheemcote* Process in this its 25th year of service to industry.

For a descriptive, beautifully illustrated brochure on this important contribution to marketing—write direct to Rheem today. No cost or obligation, of course.

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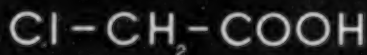
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CHLOROACETIC ACID is available in three grades: technical, purified and specially purified.

The major uses for these products are for the manufacture of weed killers, dyestuffs, pharmaceuticals and fine chemicals.

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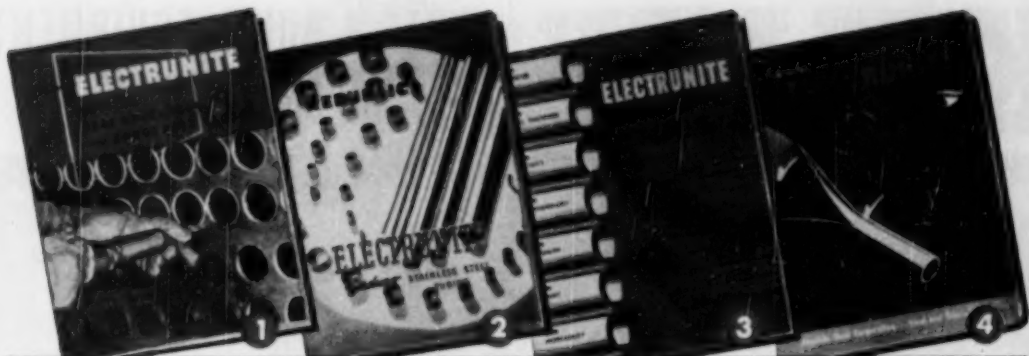
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5. Booklet — Helpful Information for Product Designers
6. Booklet — Electrical Metallic Tubing (E.M.T.)
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8. Pamphlet — Description of Dewey Process for Configuring Tubing
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**REPUBLIC STEEL CORPORATION**  
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO  
Export Department: Chrysler Building, New York 17, N. Y.

JUST FILL OUT THE COUPON

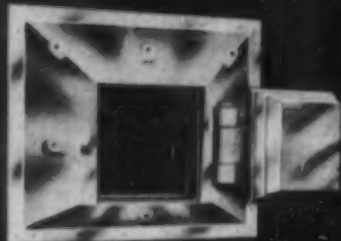
REPUBLIC STEEL CORPORATION, Steel and Tubes Division  
Department EE, 224 East 131st Street, Cleveland 8, Ohio  
Please send me the tubing data which I have checked below:

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_  
1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_ 5. \_\_\_\_\_  
6. \_\_\_\_\_ 7. \_\_\_\_\_ 8. \_\_\_\_\_ 9. \_\_\_\_\_ 10. \_\_\_\_\_



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COMPLETE  
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**CUSTOM-BUILT EQUIPMENT**  
for the **CHEMICAL** and  
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Expert Lead Burning Service at Your Plant or Ours. Specializing in complete lead installations for Acid, Chemical, Rayon, Paper and Textile Plants — Homogeneous Lead Bonded Equipment — Lead X-Ray Protection.

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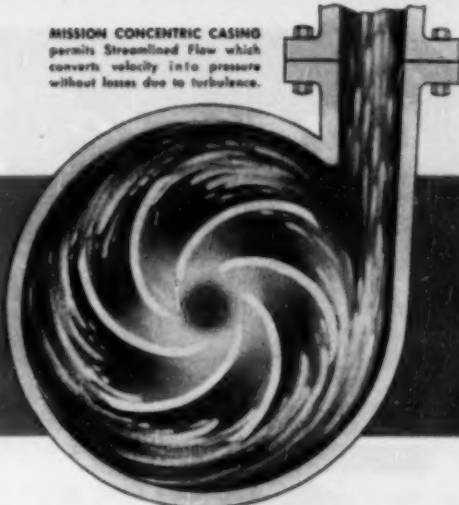
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**CONVENTIONAL CASING DESIGN.**  
Turbulence caused by cut water of conventional casing design accelerates corrosion and erosion.



**MISSION CONCENTRIC CASING**  
permits Streamlined Flow which converts velocity into pressure without losses due to turbulence.



# MISSION CHEMICAL PUMPS

*last longer in severe services . . . because*

*Streamlined Flo*

**IS IDEAL FOR SLURRIES:** Concentric casing, with semi-open-type impeller, assures free, *streamlined flow* for thick, heavy abrasive fluids.

**IS IDEAL FOR ACIDS:** *Streamlined flow* in concentric casing minimizes turbulence, corrosion and erosion caused by cut water of conventional pumps. This means long life for casing, impeller, wear-plate, shaft . . . and sustained capacity and performance.

**ELIMINATES VIBRATION:** Smooth, non-turbulent, balanced, *streamlined flow* eliminates vibration throughout entire range of operation.

\* \* \* \*

**CHOICE OF CORROSION-RESISTING ALLOYS** is another long-life factor. The four parts contacted by fluid . . . casing, impeller, wear-plate, and shaft . . . are available in cast iron, carbon steel, bronzes, aluminum, stainless steels, various types of Ni-Resist, Monel, nickel, Inconel 3, 10, or 20, and other machinable metals.

**LOW MAINTENANCE LABOR COST:** Four wearing parts are easily and quickly replaced.

**LOW SPARE PARTS INVENTORY:** MISSION stocks all parts. Our Policy: You stock emergency parts; MISSION stocks your spare parts.

**MAXIMUM FLEXIBILITY:** Only 3 pedestal sizes. High interchangeability of parts. Impeller diameters can be turned down

without appreciable loss of efficiency. Casing sizes range from 1" to 6" discharge; capacities up to 1800 GPM; heads up to 350 feet; speeds up to 3500 RPM.

**MISSION SERVICE** is prompt, dependable. This pump represents a unique but proven operating principle. You should have the facts. Mail coupon for catalog.

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Cutaway view of MISSION Pump



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# Bronze, Iron, Steel Resisting Valves—

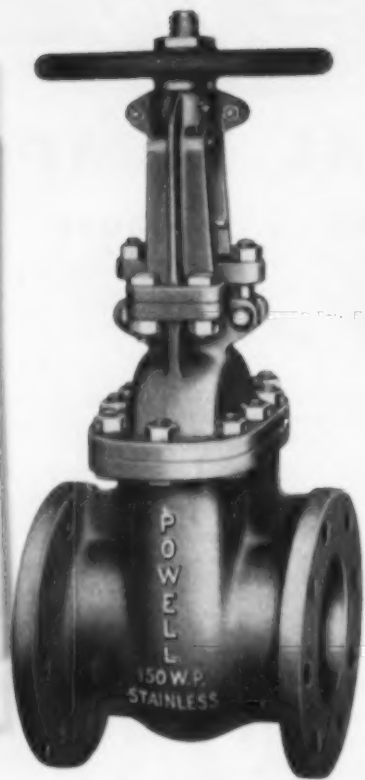


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 6" to 30", inclusive.



Fig. 1979-N1—150-pound Nickel O. S. & Y. Globe Valve with flanged ends. Gate Valves in this design are also available. These valves have been modified, and, in sizes 1½" and smaller, are now made with face-to-face dimension conforming to MSS SP-42 Standard. Sizes 2" and larger conform to A. S. A. B16.10 Standard.



Fig. 1798—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and reprimable, renewable, wear-resisting "Powellium" nickel-bronze disc.



Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

# POWELL

# and Corrosion- POWELL MAKES THEM ALL!

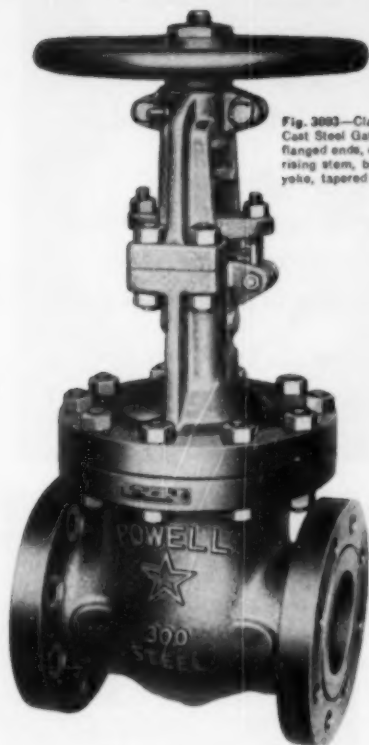


Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge.



Fig. 2433—150-pound Bronze Regrinding Spring Check Valve with flanged ends and bolted flanged cap. Disc has ample lift to permit full, straightway, unobstructed flow through the valve body.



Fig. 1808—200-pound Monel Metal Gate Valve with screwed ends, screwed-in bonnet and inside screw rising stem.

The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief, and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

Ask your nearest Distributor—or write direct

**The Wm. Powell Company, Cincinnati 22, Ohio**

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

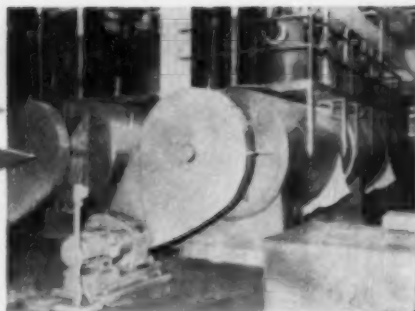
# VALVES

VACUUM DRYING

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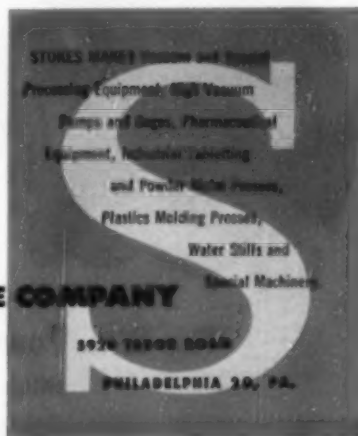
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. . . we have drying problems.

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**Now—One grease will service  
all grease applications in  
the majority of plants**



***Gives* ALL THESE PLANT SAVINGS:**

1. **Extends TIME between greasings**—lasts longer . . . stays in bearings longer.
2. **Low-cost application**—fewer servicings and only the one grease to handle.
3. **Simple inventory**—Shell Alvania Grease replaces up to 20 brands formerly required.
4. **Better protection**—against heat, cold and moisture.
5. **Greater safety**—less chance of applying the wrong grease!

***Gives* ALL THESE LUBRICATION ADVANTAGES:**

1. **Higher mechanical stability** than any conventional grease at operating temperatures.
2. **Pumpable at low temperatures**—even in unheated storage.
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4. **Impervious to water**—excellent resistance to washing out.
5. **Longer service life**—reduced consumption.

**The "MILLION-STROKE" Industrial Grease!**

A grease that will stand 100,000 punishing strokes of the ASTM Work Tester has been considered a superior lubricant.

In a deliberate attempt to break down Shell

Alvania Grease, on the same tester the run was extended . . . 200,000 strokes . . . 300,000 strokes . . . 500,000 strokes! Finally, at one million strokes the test was discontinued, because this grease would not break down—it was still a fit lubricant both in appearance and consistency.

**SHELL OIL COMPANY**

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**SHELL ALVANIA . . . The 'MILLION STROKE' Grease**

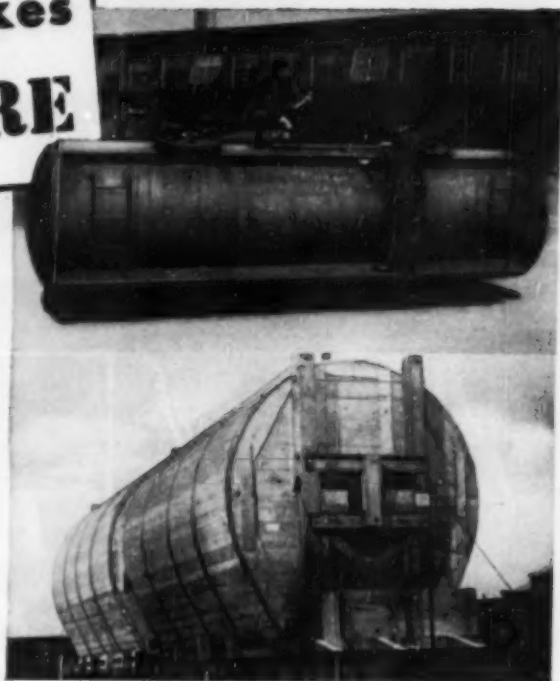
# Manhattan Takes EXTRA CARE

## BEFORE...

Manhattan Engineers measuring outlets on a truck chemical tank prior to lining.

## and AFTER

Two continuous vacuum filter drums (for filtering an organic by-product) ready for shipment showing careful method of crate protection.



## Rubber Lining Your Equipment

We have often stressed Manhattan's craftsmanship and facilities for rubber lining equipment of all sizes and shapes . . . But there is more to a good job than care during the rubber lining process. The scenes shown here of different tanks are typical of Manhattan care before rubber lining and after rubber lining.

Manhattan engineers go all over a piece of equipment before work is started on it. They take accurate measurements of such things as outlets and make sure that all specifications are accurate. These preliminary precautions avoid costly error and delay.

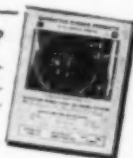
After equipment is rubber-lined, Manhattan shippers use every means to protect the job and make sure it arrives at its destination in perfect condition. A little extra expense and care in crating or boxing a tank is just good Manhattan insurance against accidental dam-

age that could waste many days of production and dollars of capital.

Your equipment is safer all around at Manhattan, where tank lining experts have established more than 40 years of leadership. Their technique of permanently bonding rubber to metal is unchallenged. Their ability to handle all shapes and sizes of equipment that can be transported is your assurance that your job will be done right. If you have never tried Manhattan call us in on your next rubber lining problem.

### Is This Folder in Your File?

It describes Manhattan Rubber Lining techniques and covers other rubber products. A copy will be mailed to you without obligation. Ask for Bulletin MR-357.



MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY



## RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

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TEST CHAMBER



LAMP and TUBE  
PRODUCTION



PENICILLIN  
PRODUCTION



COATED  
CONDENSER PAPER

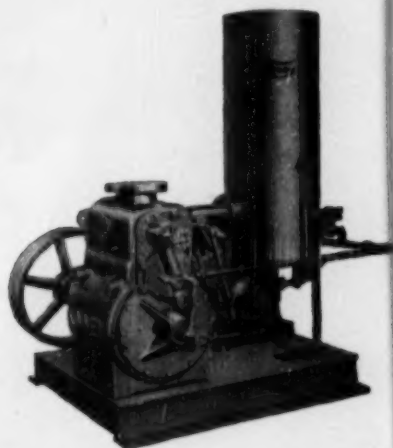


DEHYDRATING and  
DEGAUSSING OIL



## KINNEY PUMPS

*belong in your vacuum picture*



In thousands of successful applications of low pressure processing, Kinney Vacuum Pumps are setting the pace for speed and economy. Fast pump down means fast processing time—and that's why Kinney Pumps are so often picked for the job. In one case they are creating the low absolute pressure required in a gigantic synchro-cyclotron . . . in another, they are helping to turn out a steady stream of peanut-sized electronic tubes. Whether it's "one of a kind" or "mass production", Kinney Pumps have the stamina and rugged dependability to meet the toughest service conditions in every field . . . pharmaceutical or food, metallurgical or optical, electrical or electronic.

Single Stage Models are available in eight sizes: capacities from 13 to 702 cu. ft. per min. — for pressures to 10 microns Hg. abs. Compound Kinney Vac-

uum Pumps are furnished in three sizes — capacities 5, 15, and 46 cu. ft. per min. — for test pressures to 0.5 micron Hg. abs. Send for Bulletin V45 — the complete story on Kinney Vacuum Pumps, Oil Separators, and other Vacuum Pumping Accessories.

**Kinney Manufacturing Company**, 3551 Washington St., Boston 30, Mass. Representatives in New York, Chicago, Cleveland, Houston, New Orleans, Philadelphia, Los Angeles, San Francisco, Seattle.

Foreign Representatives: General Engineering Co. (Radcliffe) Ltd., Station Works, Bury Road, Radcliffe, Lancashire, England . . . Horrocks, Roxburgh Pty., Ltd., Melbourne, C. I. Australia . . . W. S. Thomas & Taylor Pty., Ltd., Johannesburg, Union of South Africa . . . Novelectric, Ltd., Zurich, Switzerland.

Making old things better.

Making new things possible.

## KINNEY Vacuum Pumps

more and better service  
from

# R·P·C

## VALVES

*...here's One Reason Why:*



Over 60 years ago,  
a PRATT & CADY Board of Directors  
passed this resolution:

### Resolved:

- “ That the superintendent
- “ shall be held responsible
- “ for the production of goods
- “ as near perfect in design,
- “ material and workmanship
- “ as shall make them merchantable
- “ and of a character that will serve
- “ to establish for this company
- “ a high reputation.”

• This policy has remained unshaken through two world wars. The “high reputation” has been maintained. More than ever before, the valves offered by R·P·C meet the demand for longer and better service.

ACCO

Reading, Pa. • Akron • Baltimore • Boston • Chicago • Denver • Detroit • Houston  
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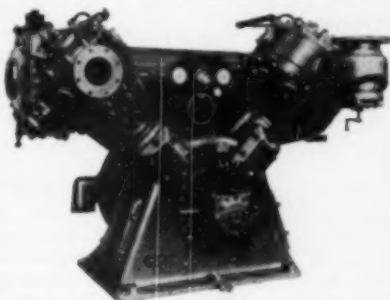
R·P·C VALVE DIVISION  
AMERICAN CHAIN & CABLE



READING-  
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VALVES

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**RUGGED  
HEAVY-DUTY  
MACHINE**  
that supplies large  
air volumes with  
**GREATEST  
EFFICIENCY!**

# JOY WN-114 AIR COMPRESSOR



The JOY WN-112 is a two-cylinder, heavy-duty, continuous type unit, having all the features of the WN-114. It delivers 368 to 1828 CFM, up to 3656 CFM in twin units.

## *Check these Features:*

- Delivers 1092 to 3656 CFM, up to 7312 CFM in twin units
- Four Cylinders, two stage, double acting, water cooled
- Requires less room, costs less to install
- Exclusive Dual Cushion Valves are more efficient, have longer service life
- Exclusive Load Control assures lower operating costs
- Simpler design—Longer life—Less maintenance

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WB011827

## JOY MANUFACTURING COMPANY

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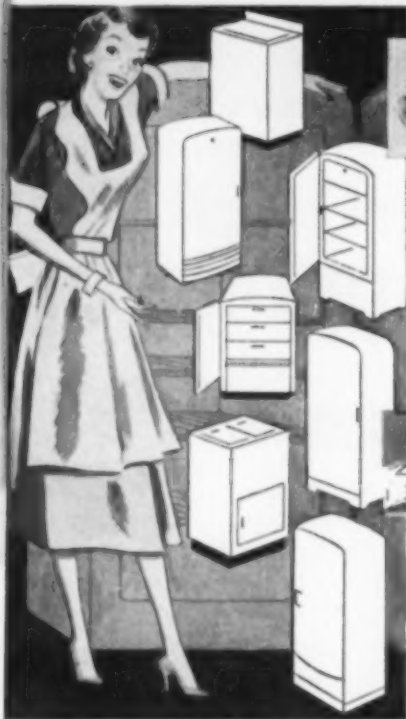


# Chemical Progress

News of developments from General Electric's Chemical Department that can be important to your business.

## FOR COLD BEAUTY—GENERAL ELECTRIC PLASTICS

Many of America's 1950 refrigerators are more beautiful, more convenient than ever—thanks to General Electric plastics contributions to the refrigerator industry. These include such features as the handy "snack box"—a molded plastics container for keeping "leftovers" at proper temperature-humidity levels; also double-panel freezer doors, molded to impart new beauty and low maintenance to this year's units. Other G-E contributions which mean better looking, more economical refrigerators are G-E plastics breaker strips, door liners, control knobs, trays, tubing, and insignia.



### When The Heat's On



Now molders may have a compound designed for application where ordinary heat-resistant materials would melt or crack. General Electric's new G-E 12810 is made with an inert glass filler and a heat-resistant silicone resin which make it ideal for molding circuit breakers, switchgears and other parts subject to high temperature extremes.

General Electric's new G-E 12810 is made with an inert glass filler and a heat-resistant silicone resin which make it ideal for molding circuit breakers, switchgears and other parts subject to high temperature extremes.

### Better Baking Enamels



Improved general-purpose baking enamels are now possible through

the use of G-E 2520 Glyptal\* alkyd resin. Excellent baking speed, toughness, adhesion and color retention recommend this short-drying oil for ranges, washing machines, refrigerators and other metal products.

## G-E CHEMICAL BREVITIES



G-E silicone bouncing putty is being used in golf ball centers, muscle exercisers, in damping devices and to protect rocket recording equipment against landing shock.

Foundries find they can reduce the baking time of cores by 50% and more through the use of General Electric's phenolic resin core binder (G-E 12300).

General Electric Textolite\* Plastics Tops are finding new applications as industrial work surfaces where resistance to wear and to certain chemicals is an important consideration.

Nitrocellulose and other types of lacquers may be improved by the addition of General Electric's new plasticizers, G-E 2557 and G-E 2559.

### FOR MORE INFORMATION

about any of the products or services mentioned on this page, write to Chemical Department, General Electric Company, 1 Plastics Avenue, Pittsfield 16, Massachusetts.

PLATE 1, 10, 100, 1000

G-E Chemical Department plants at: Pittsfield, Mass.; Schenectady, N. Y.; Waterford, N. Y.; Coshocton, Ohio; Decatur, Ill.; Taunton, Mass.; Anaheim, Calif.

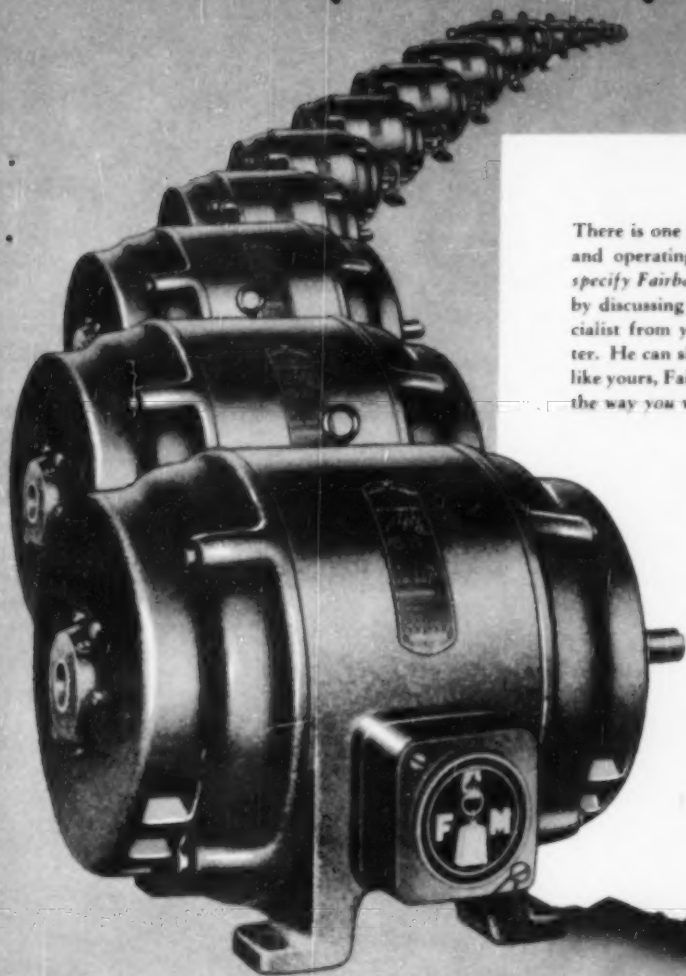
*You can put your confidence in*

**GENERAL  ELECTRIC**

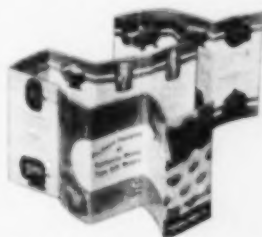
PLASTICS COMPOUNDS • SILICONES • INSULATING MATERIALS • GLYPTAL ALKYD RESINS • PLASTICS LAMINATING AND MOLDING

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## *To Keep Motor Operating Costs in Line!*



There is one proved way to keep motor maintenance and operating costs in line through the years . . . *specify Fairbanks-Morse!* This is a fact you can verify by discussing performance records with a motor specialist from your nearest Fairbanks-Morse sales center. He can show you case after case where, in plants like yours, Fairbanks-Morse Motors are saving dollars the way you want to save.



**Pocket panorama** illustrates the complete line of standard and special Fairbanks-Morse Motors. A handy guide to more motor satisfaction and savings, it's yours for the asking. Write your nearest Fairbanks-Morse Sales Center (listed on these pages).

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# the Name is . . .

## To Keep Count..by Weight!



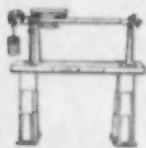
For fast, easy, accurate counting of small parts or pieces, rely on Fairbanks-Morse Counting Scales. You'll find them time-savers, cost-savers, error-savers, whether you manufacture or buy small parts in quantity. They count *by weight* right down to the last piece . . . accurately.

Fairbanks-Morse Counting Scales are a big aid in inventory control, in estimating, cost work, and in determining the volume of piecework.

In many instances, these weighing and counting instruments have paid for themselves in labor savings on one year's inventory alone. Their accuracy eliminates possible loss of customer good will over "short count" shipments . . . assures better labor relations through accurate piecework records and less fatiguing inventory work.

For more facts on Fairbanks-Morse Counting and Weighing Scales, consult your Fairbanks-Morse scale specialist.

Fairbanks-Morse Unit-Counting Dial Scale counting and weighing drum of parts during inventory.



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### *Opposed Piston*

#### **DIESEL OR DUAL FUEL POWER**

If your present power source is inadequate, too expensive or unreliable, consider installing an Opposed-Piston Diesel. Here are a few reasons why:

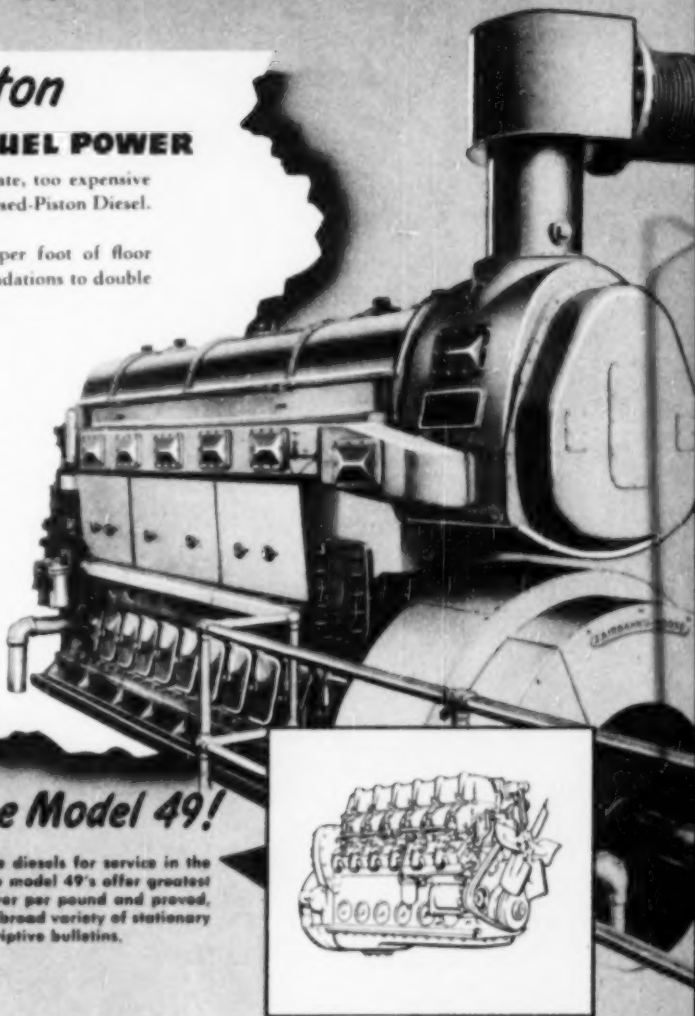
The O-P Engine packs more power per foot of floor space. It can be installed on existing foundations to double—even triple—kw-h output without costly building or remodeling.

Its fuel consumption is among the lowest. It can be operated with diesel oil—or natural or sewage gas, where available—to cut the cost per kw-h to a minimum.

It has 40% fewer moving parts to simplify maintenance . . . lower piston travel speeds to minimize wear.

It is backed by over 4,000,000 hp. in service.

No other diesel can offer you these advantages. Ask the diesel specialist at your nearest Fairbanks-Morse Sales Center for details.



### *Brand New...the Model 49!*

Here's a new line of Fairbanks-Morse diesels for service in the 20 to 120 hp. range. Size for size the model 49's offer greatest ease in maintenance, more horsepower per pound and proved, sturdy, trouble-free performance in a broad variety of stationary and portable services. Write for descriptive bulletins.

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the Name is... **FAIRBANKS-MORSE**

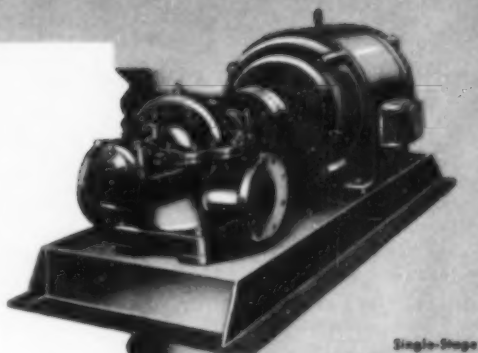
# To Keep Pumps Efficient!

Almost any centrifugal pump is efficient . . . when it's new. But, Fairbanks-Morse Centrifugal Pumps are not only efficient at the start . . . they're efficient for years. That means long, low-cost, dependable service for you.

The advanced hydraulic engineering . . . the precision manufacture . . . the quality materials . . . the thorough inspection and quality control that characterize every Fairbanks-Morse centrifugal are your assurance of efficiency that *lasts!*

The Fairbanks-Morse line of centrifugal pumps is complete . . . there is a size, type and capacity to fit any need. This completeness of line is another efficiency-adding feature since you can get exactly the pump that best suits your particular requirements . . . gives you the most for your pump dollar.

Why not have your Fairbanks-Morse Pump Specialist look over your pump picture. You'll find it pays!



Single-Stage  
Split-Case Centrifugal



Side-Suction Centrifugal



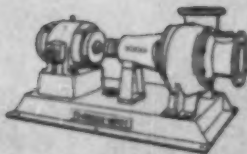
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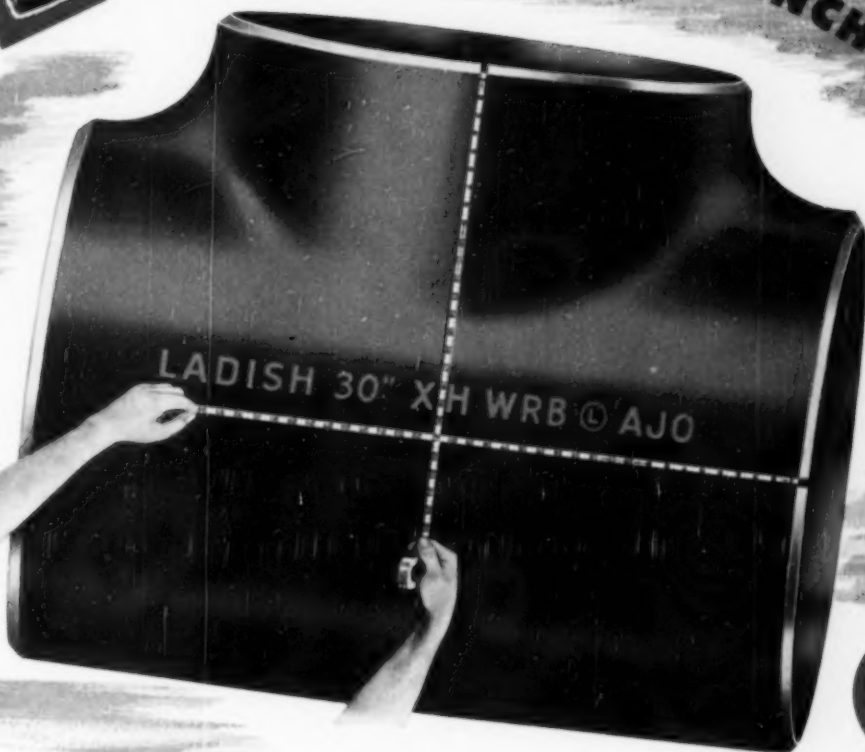
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# full branch tees

...  1/2 INCH THROUGH 30 INCHES



ANOTHER IMPORTANT DEVELOPMENT in the LADISH LINE of

*Controlled Quality* FITTINGS

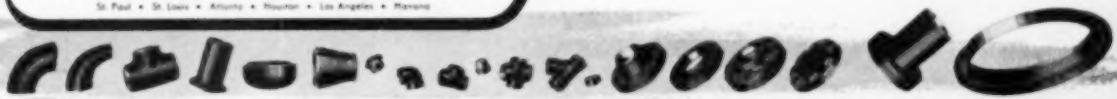
THE COMPLETE FITTINGS LINE  
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MILWAUKEE SUBURB

DISTRICT OFFICES: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago  
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To increase safety, ease of installation and welding accessibility... Ladish Welding Tees have Full Branch Outlets with identical center-to-end dimension of branch and run as is required for each size through 30 inches. Scientific metal distribution... pioneered by Ladish... adds extra protection by equalizing stress over the entire fitting and assuring maximum strength in every cross section.

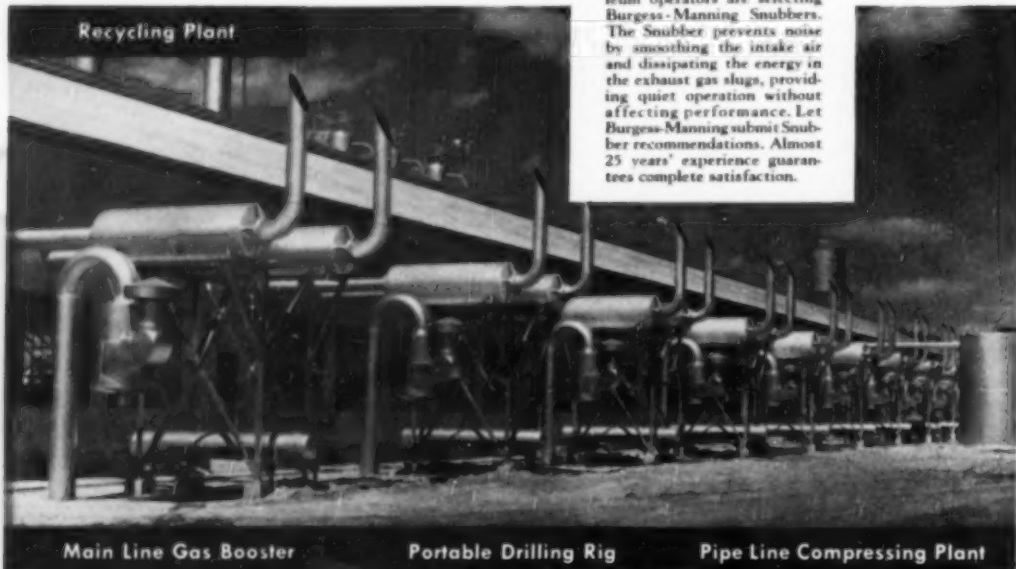


# Snub the Slug—and Stop the Noise

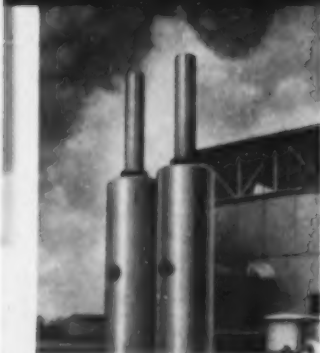
**FROM ENGINE EXHAUSTS  
AND COMPRESSOR INTAKES**

Wherever noise from internal combustion engines, compressors, blowers, vacuum pumps, cannot be tolerated; where flying sparks must be eliminated; for surge control in gas and air piping, petroleum operators are selecting Burgess-Manning Snubbers.

The Snubber prevents noise by smoothing the intake air and dissipating the energy in the exhaust gas slugs, providing quiet operation without affecting performance. Let Burgess-Manning submit Snubber recommendations. Almost 25 years' experience guarantees complete satisfaction.



Recycling Plant



Snubbers on 1600-hp Clark engines used as a main line gas booster station.



Shell Oil Co. portable drilling rig equipped with a Snubber.



Snubbers on 800-hp compressor engines of the Panhandle Eastern Pipe Line Co.

## For Quiet Telephoning—Use Burgess-Manning Acousti-Booths



You can hear easily . . . talk comfortably . . . in a Burgess-Manning Acousti-Booth, even with intense noise. Thick walls of sound-absorbent material soak up noise. Airy, easily moved, sturdy construction.

## INSTALLATIONS—

- Stationary and portable internal combustion engines
- Steam discharge
- Positive displacement and reciprocating vacuum pump discharge

**APPLICATIONS—**gas transmission • repressuring • recycling • refineries • gasoline plants • drilling • oil well pumping • crude oil and product pipe lines.

**BURGESS-MANNING COMPANY**  
LIBERTYVILLE, ILLINOIS



# FLAKE FORMALDEHYDE

...it may be just what  
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Are you searching for processing shortcuts? Flake Formaldehyde, developed by Celanese, may supply the answer to your problem as it has for many processors in fields ranging from modified and high solids resins to fine chemical synthesis.

Flake Formaldehyde is formaldehyde in its most available and easily stored form. Its low water content—less than 9%—is a necessity where almost anhydrous conditions are required and a time and money saver when water must be removed from the final product.

In addition, Celanese\* Flake Formaldehyde eliminates the need for heated formalin storage tanks. It

is available in multiwall bags and fibre drums . . . offers easy, dustless handling.

We'd like to talk to you about your particular problems . . . tell you about other advantages that flake has to offer. Call your Celanese representative, or write: Celanese Corporation of America, Chemical Division, Dept. 53-F, 180 Madison Ave., New York 10.



**Celanese**  
CHEMICALS

\*Reg. U. S. Pat. Off.

ACIDS • ALCOHOLS • ALDEHYDES • GLYCOLS • KETONES • PLASTICIZERS • SOLVENTS

**SPECIAL . . .  
FOR USE WITH  
HIGH FLUID  
VELOCITIES**

**...THE  
SERIES 700V  
DIAPHRAGM CONTROL VALVE  
WITH VENTURI THROAT**



**H**igh fluid velocities . . . even viscous fluids and fluids containing suspensions . . . are pushovers for the Series 700V. A special venturi throat eliminates the sudden change in direction of flow so often the cause of trouble under such conditions. As a result, in-service time is unusually high.

**OUTSTANDING FEATURES OF THE 700V**

- Special flushing connection to keep stem operation free.
- Special design, renewable disc and seat ring.
- Special materials for body and trim to meet prevailing operating conditions.
- Special provision for field conversion from straight through to angle operation.

You'll save a lot in maintenance costs alone, if you standardize on the Series 700V for high fluid velocities. Call in your local Honeywell engineer for complete information . . . he is as near as your phone!

MINNEAPOLIS-HONEYWELL REGULATOR CO., Industrial Division, 1904 Windrim Avenue, Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

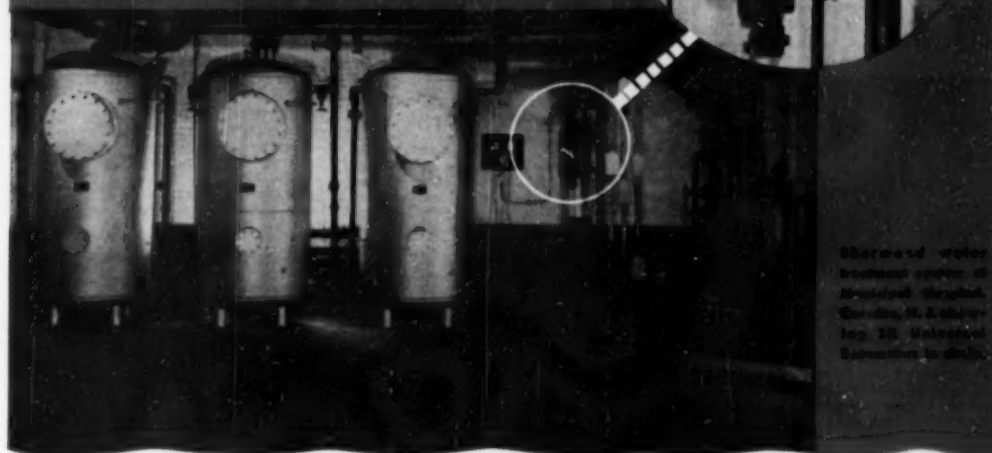


**Honeywell**

**VALVE PRODUCTS**

**NEW WATER CONDITIONING SYSTEM**

**USES SK UNIVERSAL ROTAMETERS**



Sherwood water treatment system at Municipal Hospital, Camden, N. J. utilizes 12 Universal Rotameters to control

THE installation of a new Water Treatment System\* designed for treating municipal water was recently announced by the City of Camden, New Jersey. In operation at Municipal Hospital, this system reduces the corrosive characteristics of the city water which is obtained from artesian wells.

To maintain a proper ratio of flow of water and air into the system, Mr. C. P. Sherwood, designer of the Sherwood Water Conditioning System, chose a No. 9 SK Universal Rotameter to measure the rate of flow of the water and a No. 4 SK

Universal Rotameter to measure the rate of flow of the air admitted to the system.

Low in installation costs, due to the compactness of the system, and economical in operation, since operating costs are confined to compressing a small amount of air and providing minimum supervision, the new system removes such corrosive agents as iron, manganese and carbon dioxide from the water by aerating the water under pressure. No chemicals or zeolite derivatives are used in the process.

Put SK Rotameters to work for you. Write for Bulletin 18-RB and get complete details.

\*Patent Applied for



**SCHUTTE and KOERTING Company**

*Manufacturing Engineers*

1190 THOMPSON ST. • PHILADELPHIA 22, PA. • TWX No. 1 PH 762

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS • FLOW INDICATORS • RADIATION TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS



# For Your Information

Every month Monsanto publishes these pages of pertinent information, selected to help you improve your products, lower your production costs, increase your sales. Detailed information on products listed on these pages... or on any of the more than 400 Monsanto Chemicals and Plastics... will be sent promptly upon request.

## MONSANTO SANTICIZER 141 ACCEPTED BY BAI FOR USE IN FOOD WRAPPINGS



Polyvinyl chloride film, plasticized with Santicizer 141, heat-seals easily and securely.

Based on the results of feeding and extraction tests extending over two years, the Meat Inspection Division of the Bureau of Animal Industry, United States Department of Agriculture, has accepted Santicizer<sup>®</sup> 141 as a plasticizer for synthetic plastic films used to pack food products. This is positive proof of the non-toxicity

of Monsanto Santicizer 141... proof that Santicizer 141 is the plasticizer to use in any application where non-toxicity is required.

The BAI acceptance of Santicizer 141 opens new fields for the use of synthetic plastic chloride films. It suggests the use of these films in packaging meats, cheese, margarine and scores of other products affected by the trend to self-service in food stores.

Polyvinyl chloride film, plasticized with Santicizer 141, is tougher than most other films, hence, less likely to tear. It provides excellent protection because it heat-seals easily and securely. With Santicizer 141, it is possible to make film that is easy to print and process and which has excellent low-temperature flexibility.

For further information on Santicizer 141, mail the coupon or contact the nearest Monsanto Sales Office.

### Monsanto HB-40 cuts cost in plasticizers

Monsanto HB-40 (partially hydrogenated terphenyl), used as an extender for primary plasticizers, cuts costs substantially for manufacturers of vinyls. HB-40 is low in price and a high percentage of the total weight of plasticizer can be used.

HB-40 is extremely low in toxicity. Being

practically water-white, it can be used in transparent and brilliantly colored products. It has excellent electrical characteristics and moisture resistance. Non-migratory HB-40 gives a dry hand and increases tensile strength. For technical data and quotations, mail the coupon or contact the nearest Monsanto Sales Office.

## Research Chemists' Corner

You may find something new here

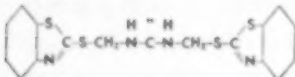
Di-benzothiazyl-dimethyl thiolurea may be just the chemical you're looking for to help you in developing something new. Perhaps you can see the chemical's possibilities simply by looking over the speci-

fications below. Maybe you'd like to do some experimenting. If you would, mail the coupon and we'll send you a sample without charge and without putting you under any obligation.

### di-benzothiazyl-dimethyl thiolurea

1,3 bis(2-benzothiazylmercaptomethyl)urea (Chemical Abstracts name)

#### Structure:



Appearance: Cream-colored powder

Finesness: 99.5% thru 200-mesh

Moisture: Less than 1.0%

#### Ash:

Less than 0.7%

#### Melting Point:

220° C. Min.

#### Specific Gravity:

1.29 at 25° C.

#### Solubility:

Very low for all solvents. Slightly soluble in hot pyridine and orthodichlorobenzene. Very slightly soluble in acetone, alcohol and chloroform.

## World's best line of alkyd resin-producing materials available

If alkyd resin making is an activity under your direction, it will be worth your while to investigate Monsanto's line of materials... the best line to be found anywhere. Make Monsanto your supplier and you will be sure of getting products of highest quality, plus dependable service.

Monsanto's alkyd resin-making materials, which also have numerous other uses, are:



#### BENTHALL<sup>®</sup> (Alkyd Resin Intermediate)

... A technical benzoic acid, containing 5% phthalic anhydride. It reduces viscosity, allowing reduction of acid value, retards yellowing, improves stability and flow.

#### MALEIC ANHYDRIDE...

A versatile intermediate used alone or with other acids in making alkyd-type resins. Available from Monsanto as briquettes, flakes or solid.



#### TRIPHENYL PHOSPHITE...

A color stabilizer in pale-colored alkyls and other products.

#### PHTHALIC ANHYDRIDE...

An intermediate in making plasticizers, alkyd resins and numerous other products.



For further information on any or all of these products, indicate your wishes on the coupon or contact the nearest Monsanto Sales Office.

## Source of quality phosphates to use in quality products

Quality ingredients are an assurance of quality finished products. That's why many manufacturers who require phosphoric acid and phosphates rely on Monsanto. These Monsanto products are derived from Monsanto-produced elemental phosphorus. From this pure phosphorous, quality-controlled Monsanto processes bring you phosphoric acid and phosphates with the uniform, high quality that gives you dependable results.

Monsanto Phosphate Division products include:

**PHOSPHORIC ACID**—Food processing, pharmaceutical manufacture, sugar clarification and metal treatment.

**TRI SODIUM PHOSPHATE**—A white crystalline material, uniformly sized, quickly soluble in water giving an alkaline reaction. pH value of 1% solution, 11.8. Used in household and industrial cleaners and detergents . . . in fruit cleaning and water softening.

**MONO SODIUM PHOSPHATE**—A white powder. pH value of 1% solution, 4.5. Used in water conditioning and acid cleaners.

**DI SODIUM PHOSPHATE, ANHYDROUS**—In granular or powder form. Soluble in water; insoluble in alcohol. pH of 1% solution at 25° C., 8.8. Used for water conditioning, cheese processing, condensed milk stabilizer and industrial cleaners.

**TETRA SODIUM PYROPHOSPHATE**—White granular or powdered material, pH value of 1% solution, 10.2. Used in textile processing, in household and industrial cleaner and detergent mixtures, metal cleaning, as a soap builder.

**SODIUM TRIPOLYPHOSPHATE**—A white powder, quickly soluble in water. pH of 1% solution, 9.6. Used in manufacture of cleaning compounds and as a soap builder.

### Other Monsanto Phosphates

Sodium Acid Phosphosphate  
Mono Calcium Phosphate  
Di Calcium Phosphate  
Calcium Pyrophosphate  
Tri Calcium Phosphate  
Mono Ammonium Phosphate  
Di Ammonium Phosphate  
Mono Potassium Phosphate  
Di Potassium Phosphate  
Tri Potassium Phosphate

Tetra Potassium Pyrophosphate  
Hexamodium Phosphate  
Magnesium Phosphate  
Aluminum Phosphate  
Iron Phosphate  
Alkali Acid Phosphates  
Alkali Alkali Phosphates  
Special Phosphates

## HOW MANY TIMES CAN A TIRE FLEX ITS MUSCLES?



Flexometer, above, is testing various rubber compounds in the Monsanto Rubber Service Laboratory.

Monsanto's Rubber Service Laboratory, in Akron, Ohio, quickly comes up with the right answers to such questions as: "How many times can a tire flex its muscles?"; "How long will soles wear on tennis shoes?"; "What rubber compound is best for V-belts?" . . . and many others.

The laboratory serves the rubber industry exclusively. Results of its work have brought forth many advancements in the formulation of natural, synthetic and re-

claimed rubber compounds. If you are a manufacturer with a problem concerning rubber, you may submit it to the Monsanto Rubber Service Laboratory . . . without cost and without obligation.

Monsanto produces a long list of chemicals for the rubber industry, including antioxidants, accelerators, wetting agents, reodorants, stabilizers and colors. For information on rubber chemicals, mail the coupon.

## Santobrite stops mold in soap wrappers

Mold in soap wrappers long has been a problem with both soap makers and paper manufacturers. Now Monsanto Santobrite\* (sodium pentachlorophenate, technical) has been proved to be a means of eliminating the difficulty in casein-coated papers. As little as 0.2% of Santobrite, based on the weight of casein in the size, stops mold discoloration. The addition of Santobrite to the paper stock and to adhesives also is recommended.

### Get the bulking you want with SANTOMERSE No. 1

If you want to give your product bulk with light weight, Monsanto Santomerse\* No. 1 will help you get it. If you want weight but little bulk, Santomerse No. 1 fits into your plan. If you are seeking a compound that falls between these extremes, Santomerse No. 1 will be useful to you.

The reason: Santomerse No. 1 is available in three weights, drums of the same volume weighing 175 pounds, 200 pounds and 225 pounds.

\*Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY, 1702-F South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.



SERVING INDUSTRY . . . WHICH SERVES MANKIND

### Information

- ☐ Benthal ☐ Maleic Anhydride ☐ Triphenyl Phosphate ☐ Phthalic Anhydride  
☐ Rubber Service Laboratory  
☐ Rubber Chemicals  
☐ Santobrite for soap wrappers  
☐ Santizer 141 ☐ HB-40

### Sample

- ☐ Di-benzothiazyl-dimethyl thiolurea

### MONSANTO CHEMICAL COMPANY

1702-F South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information as indicated at the left.

Name  Title

Company

Street

City  Zone  State

$C_7H_6O$   
BENZALDEHYDE  
FROM

TENNESSEE

Are you completely satisfied with your present supply service for commercial and fine chemicals?

Can you count on uniform quality, ample supply, perfect delivery?

If you can't give an immediate "yes" to these important questions then you'd better see the men from Tennessee.

We supply *good chemicals* on the *good business* basis of more service for the buyer. . . whether your orders be large or small.

Request our latest price list and specifications. Better still, place an order; let us demonstrate the service you get when you order chemicals from Tennessee.



**TENNESSEE**  
PRODUCTS AND CHEMICAL

*Corporation*

NASHVILLE, TENNESSEE



# For any commercial application requiring a Glassy Sodium Phosphate SPECIFY

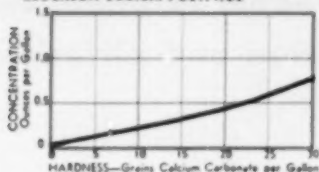


## BLOCKSON SODIUM POLYPHOS\*

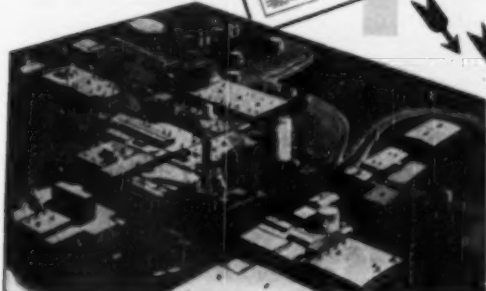
★ In Sodium Polyphos, Blockson provides a water soluble Glassy Sodium Phosphate of standardized composition in the middle of the glass forming range of Sodium Phosphates . . . for use in all commercial applications where Glassy Sodium Phosphates are indicated. Ground and lump sizes. Mail coupon for bulletin and sample.

EMPIRICAL FORMULA:  $\text{Na}_2\text{P}_3\text{O}_{10}$   
COMPOSITION: 1.2 Na<sub>2</sub>O, 1 P<sub>2</sub>O<sub>5</sub>  
STRENGTH: P<sub>2</sub>O<sub>5</sub> 63.5% pH of 1% solution is 7.2  
SOLUBILITY: 150 parts in 100 parts of water at 75° F.

Sequestration and Water Softening Capacity  
BLOCKSON SODIUM POLYPHOS



FOR FURTHER DATA  
AND SAMPLE  
MAIL COUPON



On this 200-acre site, an hour from the nation's railway hub, the vast BLOCKSON organization is coordinated into a closely knit group under intimate executive supervision for prompt service to American industry, large and small.

### WATER SOFTENING—

**SEQUESTRATION** Precipitation of calcium and magnesium salts, which normally occurs with increased temperature or alkalinity, is inhibited when minute quantities of Sodium Polyphos are added to hard water. Larger additions prevent precipitation by forming inert complexes\* with the hardness elements. Precipitates already formed will re-dissolve. These complexes won't react with soap added to cleaning bath or formed by saponification of greases and oils by alkaline detergents. Sticky, fabric-encrusting and equipment-clogging soap curds are avoided. **THUS SODIUM POLYPHOS IS A VALUABLE ADJUNCT TO EVERY DETERGENT OPERATION.**

\*Also forms inert complexes with metallic ions of iron, copper, nickel, manganese and zinc.

**DISPERSION**—Sodium Polyphos exhibits to a remarkable degree the property of increasing dispersion of finely divided solids in a liquid medium. Typical applications include: dispersion of clay for coating papers, reducing viscosity of muds for drilling oil wells, water suspension of organic pigments. These, and the listing below, may suggest experimental application to your own particular problem.

**OTHER KNOWN USES**—Industrial and municipal water treatment: for preventing scale formation, iron precipitation, and for corrosion control. Boiler compounds, dishwashing and detergent compounds, processing and dyeing of textiles, leather tanning, photographic film developing, flotation and deuliming of minerals.

### OTHER BLOCKSON CHEMICALS

- Sodium Tripolyphosphate Anhydrous
- Tetrasodium Pyrophosphate, Anhydrous
- Sodium Silicofluoride
- Sodium Fluoride
- Trisodium Phosphate, Crystalline
- Chlorinated Trisodium Phosphate
- Trisodium Phosphate, Monohydrate
- Disodium Phosphate, Anhydrous
- Disodium Phosphate, Crystalline
- Monosodium Phosphate, Anhydrous
- Monosodium Phosphate, Monohydrate
- Sodium Acid Pyrophosphate
- Light Alumina Hydrate
- Glass White
- Sulfuric Acid



\*Sodium Polyphos is a brand name

BLOCKSON CHEMICAL CO., Joliet, Illinois

Send bulletin on Blockson Sodium Polyphos

Include sample: ☐ Ground ☐ Lump Walnut ☐ Lump Pea

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_ Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



# NEW POROUS MEDIA BOOKLET

— the most complete  
available

**Here are 56 pages of invaluable information  
covering all fields of filtration and diffusion**

Yours for the asking is this comprehensive new booklet on porous ceramic media by CARBORUNDUM. It contains a wealth of useful material — including many charts, tables and photographs — which should make it the principal reference source for technicians in all fields of filtration and diffusion. It covers applications, design, specifications, installation and operation. A glance at the table of contents will indicate the scope of information included.

Dept. M-60  
Refractories Div., Carborundum Co.  
Perth Amboy, N. J.

Send my complimentary copy of the new "Porous Media" booklet to:

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

## PART 1—GENERAL DESCRIPTION AND PROPERTIES

Composition and Structure  
Grades  
Solubility  
Strength  
Uniformity  
Refractory Properties  
Porosity  
Capillarity  
Density — Weight

## PART 2—FILTRATION

Underdrains — Water Filtration  
Underdrains — Softening and  
Demineralization  
Underdrains — Special Uses  
Diatomite Filtration  
Direct Liquid Filtration  
Direct Gas Filtration  
Miscellaneous Applications

## PART 3—DIFFUSION

Background and Applications  
Design of Tanks and Air  
Requirements  
Diffuser Design  
Diffuser Types  
Diffuser Requirements  
Diffuser Grade and Permeability  
Pressure Loss  
Advantages of ALOXITE Diffusers  
Installation and Operation

## PART 4—PRODUCT SPECIFICATIONS

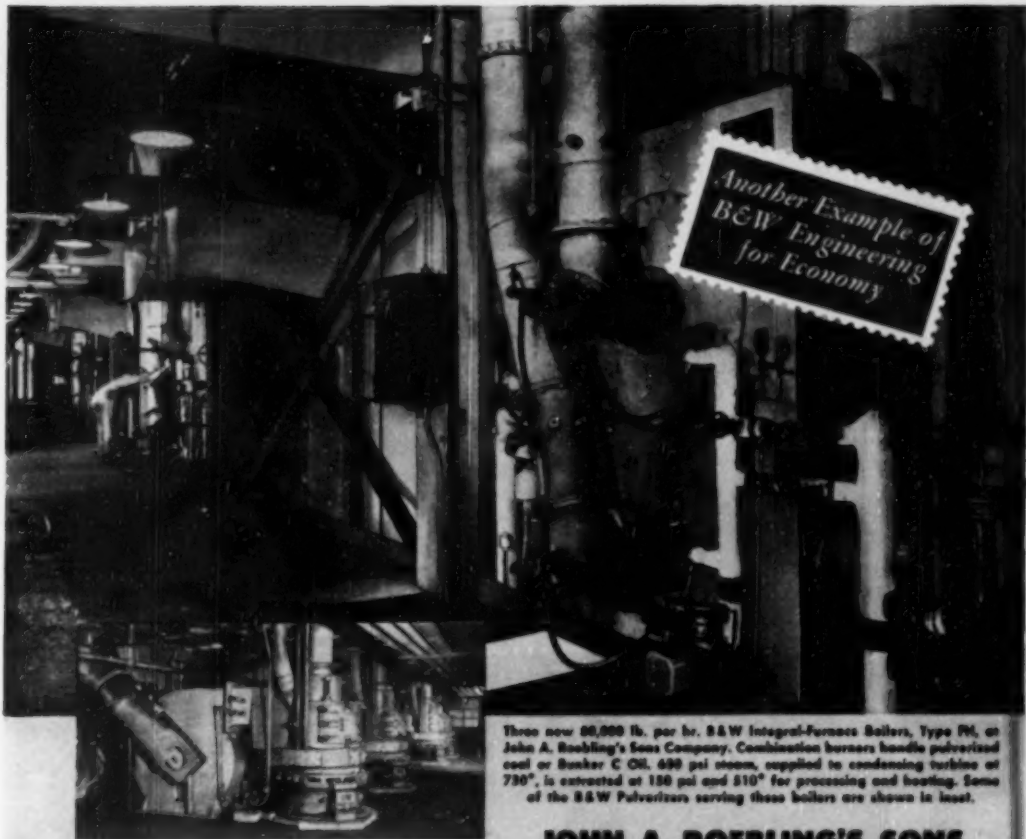
Details of Underdrain Plates  
Specifications for Underdrain  
Plates  
Details of Filter Plates  
Details of Filter Tubes  
Specifications for Filter Plates  
and Tubes  
Details of Diffuser Plates and  
Tubes  
Specifications for Diffuser Plates  
and Tubes



**THE CARBORUNDUM COMPANY**  
Refractories Division  
PERTH AMBOY, NEW JERSEY

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company





Three new 60,000 lb. per hr. B&W Integral-Furnace Boilers, Type FH, at John A. Roebling's Sons Company. Combination burners handle pulverized coal or Bunker C Oil. 498 psi steam, supplied to condensing turbine at 730°, is extracted at 180 psi and 510° for processing and heating. Some of the B&W Pulverizers serving these boilers are shown in inset.

## JOHN A. ROEBLING'S SONS

### REPORT \$250,000 ANNUAL SAVINGS

#### WITH NEW POWER PLANT

Saving a quarter of a million dollars a year with a complete new power plant makes mighty good sense to profit-minded management. And that's just what John A. Roebling's Sons Co., Roebing, N. J., are doing with their new steam and electric generating plant—completely equipped with B&W Integral-Furnace Boilers, Type FH, and with B&W ball-bearing-type Pulverizers.

Generation of by-product electrical energy will result in savings of over \$100,000 annually—in increased boiler efficiency, reduced maintenance and

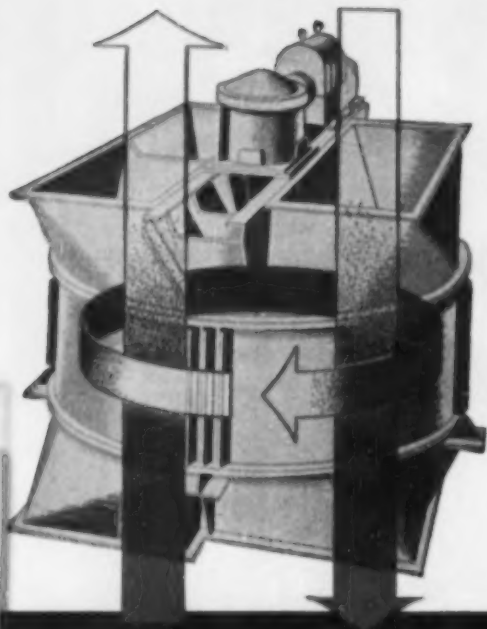
operating labor costs will add another \$150,000. These economies—which include a 9,000 ton annual reduction in coal consumption—are expected to pay for the plant in from 8 to 10 years. Constructors were the Rust Engineering Company.

Like Roebing, you will find new paths to profits opened up when B&W Engineers are in on the start of any modernization or expansion program or the construction of an entirely new plant. Their advice has proved eminently sound for more than 80 years. Write today for Bulletin G-38. It gives you complete details on B&W Integral-Furnace Boilers, Type FH. The Babcock & Wilcox Co., 85 Liberty Street, New York 6, N. Y.

**BABCOCK  
& WILCOX**



*Helping Industry Cut Steam Costs Since 1867*



this preheater  
can save you money  
whatever  
your fuel



## the *Ljungstrom* AIR PREHEATER

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

All fuels burn better with preheated combustion air, and it is a "must" for many of them, such as high moisture powdered coal. In addition, the *continuous regenerative counterflow* principle of Ljungstrom permits reliable operation at low exit gas temperature. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

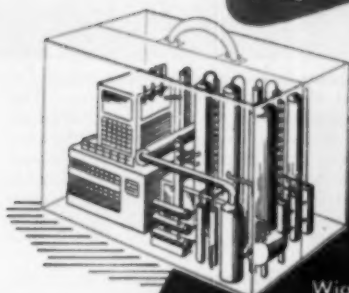
The efficiency and reliability of the Ljungstrom air preheater is a matter of record in industrial and utility plants throughout the country. That is why every year a constantly increasing percentage of the installed boiler capacity is equipped with Ljungstrom air preheaters.

If you are planning a new installation, or modernizing your present one, our engineers will welcome the opportunity to show you how the Ljungstrom can raise the efficiency of your plant.

**THE AIR PREHEATER**  
60 East 42nd Street, New York 17, N. Y.  
**CORPORATION**

A NEW CONCEPT  
IN PLANT  
CONSTRUCTION...

**"PACKAGED PLANT  
CONSTRUCTION"**  
A Complete Service  
from PLANNING  
to PRODUCTION



It is a service by  
Wigton-Abbott Corporation that broadens  
the definition of plant construction to include creation of  
the process, designing and installation of equipment  
and "delivers" the complete plant, ready for operation.  
To perform and to coordinate these complex functions,  
Wigton-Abbott Corporation employs the experience and  
skill of engineers and architects—including specialists in all  
branches of chemical, mechanical, electrical, civil and  
industrial engineering. The Construction Department is staffed  
and equipped to erect any type of industrial plant.  
A Wigton-Abbott Corporation representative  
will be glad to consult with you on any  
phase of plant design and construction.

*Yours for the asking...*

Reading time, only 10 minutes—but  
it will save you many hours by answering  
basic questions.

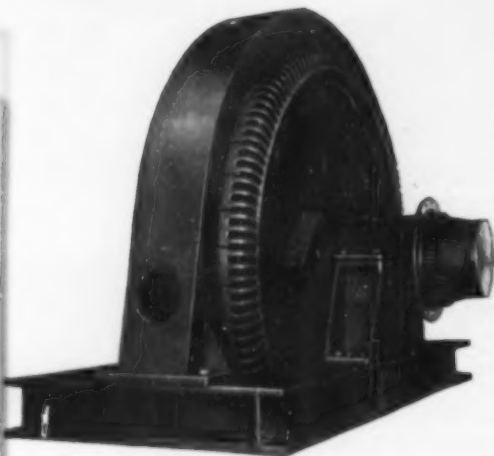


**Wigton-Abbott Corporation**

DESIGNERS...ENGINEERS...CONTRACTORS...PLAINFIELD, NEW JERSEY

# Save on original costs

## use G-E synchronous



**You'll save money** in many applications when you specify General Electric synchronous motors. The chart shows (ratings above the black line) the applications where synchronous motors (including control and exciter) have a lower first cost than any other kind of motor. And even in cases where there is no original saving (between red and black lines) you can save on over-all cost by specifying synchronous motors to increase operating efficiency and improve power factor.

When you specify G-E synchronous motors, you get application engineering by experts in the electrical problems of *your* industry. You get the motor that gives you greatest return on your investment.

For your next large, constant-speed motor, ask your General Electric sales representative to tell you how you can take full advantage of the money-saving features of G-E synchronous motors. Or write for bulletins on your letterhead to Section 770-17, Apparatus Dept., General Electric Co., Schenectady 5, N.Y.

Low speed...GEA-5332      High speed...GEA-5426  
Control...GEC-505

### PROTECT YOUR SAVINGS WITH

#### G-E SYNCHRONOUS MOTOR CONTROL

New rotor field circuit provides accurate field application—motor is protected against starting shock.

New rotor field circuit keeps constant check on motor performance and, on pull-out, field is removed before first slip cycle is completed—to protect against electrical and mechanical damage.

In addition to the protection offered by the new rotor field circuit, the new, smaller air-break limitump controller provides fast-acting EJ-2 fuses that limit short circuits to less than one-half cycle for motors up to 5000 volts.

Low-voltage motors (up to 600

volts) are protected by compact, easily inspected air-circuit breakers.

**To make it easier** to install, to adjust, to operate, and to service, G-E synchronous control is factory-mounted in a steel enclosure with anti-glare meters and all the built-in accessories required for your application.

Come to General Electric for the engineering and manufacturing that will assure you of adequate protection of your motor and plant investment. Write for more information on this precise motor control.



GENERAL  ELECTRIC

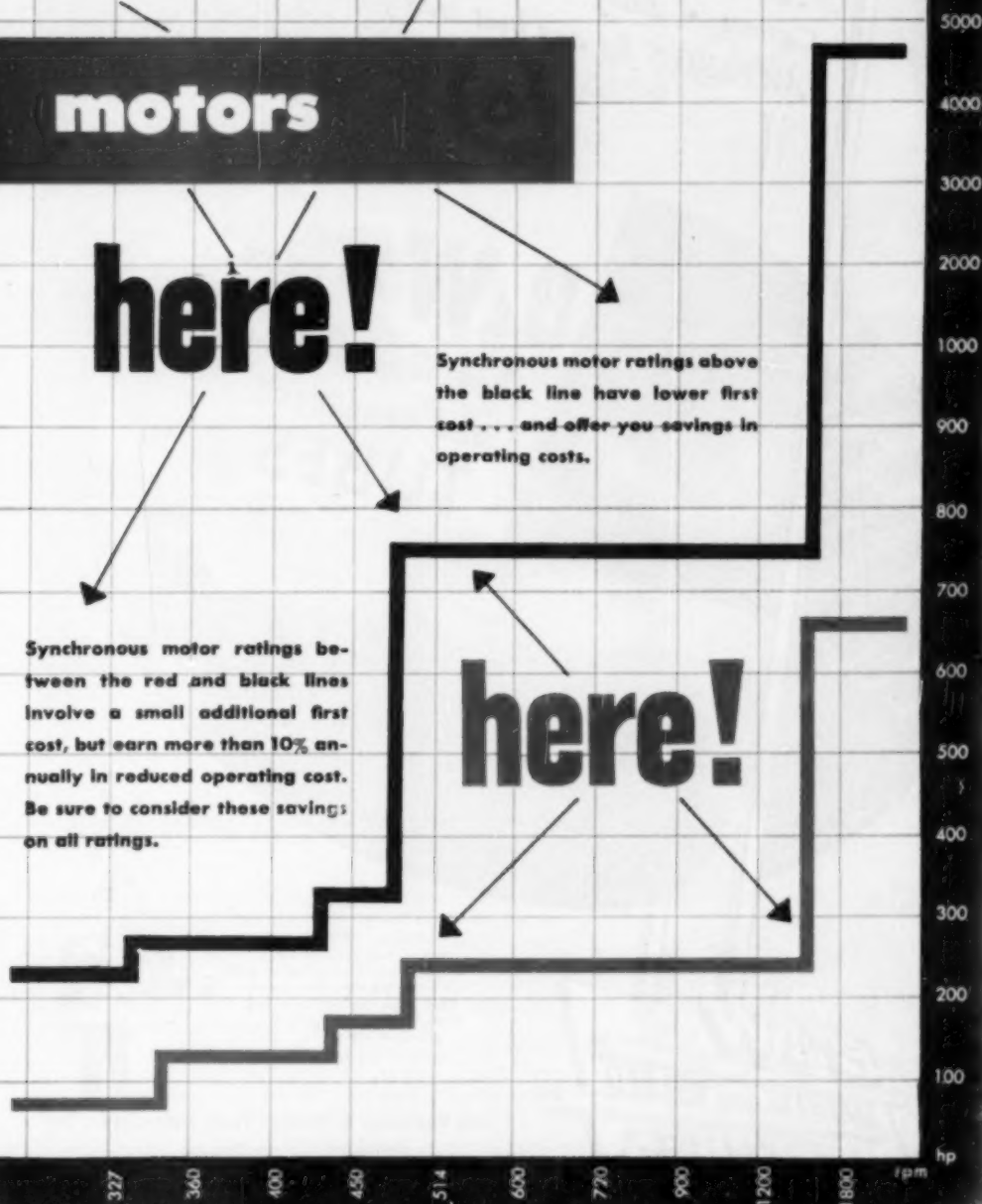
# motors

## here!

Synchronous motor ratings above the black line have lower first cost ... and offer you savings in operating costs.

Synchronous motor ratings between the red and black lines involve a small additional first cost, but earn more than 10% annually in reduced operating cost. Be sure to consider these savings on all ratings.

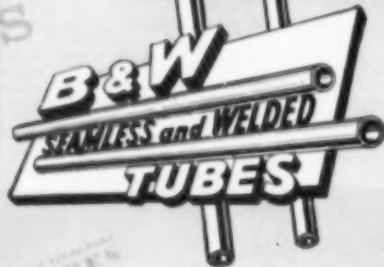
## here!





Carbon • Alloy • Stainless Steel!  
ARTERIES for any heat transfer unit

**B&W** SEAMLESS  
AND WELDED  
heat exchanger  
and condenser  
**TUBES**



QUICK SERVICE on your  
tubing requirements for  
original equipment or replacement  
is available from your nearest  
B&W Tube representative and  
through local distributors in  
principal cities.

Write for new Bulletin T 8 329.



**THE BABCOCK & WILCOX TUBE COMPANY**

General Offices: Beaver Falls, Pa.

Plants: Alliance, Ohio, and Beaver Falls, Pa.

Sales Offices: Alliance, Ohio • Beaver Falls, Pa. • Boston 16, Mass.  
Chicago 3, Ill. • Cleveland 14, Ohio • Denver 2, Colo. • Detroit 26, Mich.  
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2, N. Y. • Toronto, Ontario • Tulsa 3, Okla. • Vancouver, British Columbia

DA-1523-C

# Piccolyte

## PAGEANT

*Pick Any One..*



*and you get them all*

Even if you select only *pale color* as the Piccolyte virtue you want, you will find that the other inherent advantages of this versatile synthetic resin provide many practical benefits. Stability, low-cost, compatibility with other materials, chemical inertness, petroleum-solubility are but a few of the features that you can use to improve your products and reduce your costs.

Piccolyte is economical, and easy to use. It is available in nine grades, from soft to hard, horny. Write for a generous test sample, and describe your application so that we can send a suitable grade.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.

Clairton, Pennsylvania

Plants at Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

Distributed by Pennsylvania Folk Chemical Co., Pittsburgh 30, Pa.  
and Harwick Standard Chemical Co., Akron 5, Ohio



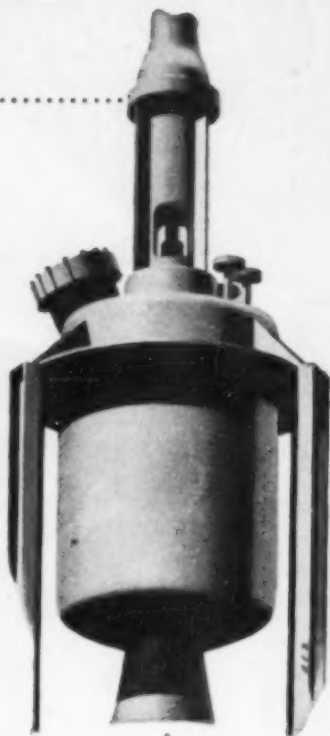
# How to Keep Caustic Base Dyestuffs on Shade



To improve production, a manufacturer of caustic base dyestuffs recently installed a modern 500-gallon nickel-clad steel high-pressure autoclave. The new design assures efficient agitation, controlled heating and other foolproof safety features to provide maximum efficiency in operation. Bottom monel outlet valve is cone protected. Shielded thermocouple blocks attached to the kettle give both protection during firing and control of firing zone temperatures. Corrosion is resisted, metallic pickup prevented—either one of which would result in dull or off-shade product. Increased production and high uniform quality are assured.

Such strides in processing equipment in the last two decades have resulted in increased efficiency . . . lower maintenance and operating costs . . . improved products. Many of these equipment improvements result from cooperative effort of the designer, engineer, fabricator and materials supplier. We call this *Lukonomics*. Such an approach is at your disposal to help solve today's critical problem—widening the margin between your costs and selling price.

To obtain the advantages of equipment made by fabricators applying the Lukonomics principle, write our Manager of Marketing Service, Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.



*This 500-gallon autoclave, installed at a Pennsylvania dyestuffs plant, was fabricated by Blaw-Knox Division of Blaw-Knox Company of Lukens Nickel-Clad Steel Heads and Plates.*



LUKENS STEEL COMPANY

## BETTER PRODUCTS FOR BETTER EQUIPMENT

# CARBO-DUR

The most effective  
agent for removal  
of taste and odor  
from water...



## *This can be said only of Carbo-Dur:*

- Produces more than four times as much chlorine-free water as any other water-treating carbon!
- Carbo-Dur has higher phenol absorptive value than any other activated carbon!
- Carbo-Dur wets fast, sinks fast . . . never floats in water!
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There's no doubt about it . . . Carbo-Dur is the best activated carbon available. It re-

moves all taste and odor from waters quickly and efficiently . . . gives best results and lasts much longer. Get all the facts . . . then try it!

Write for full information to The Permutit Company, Dept. CE-6, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., Montreal.

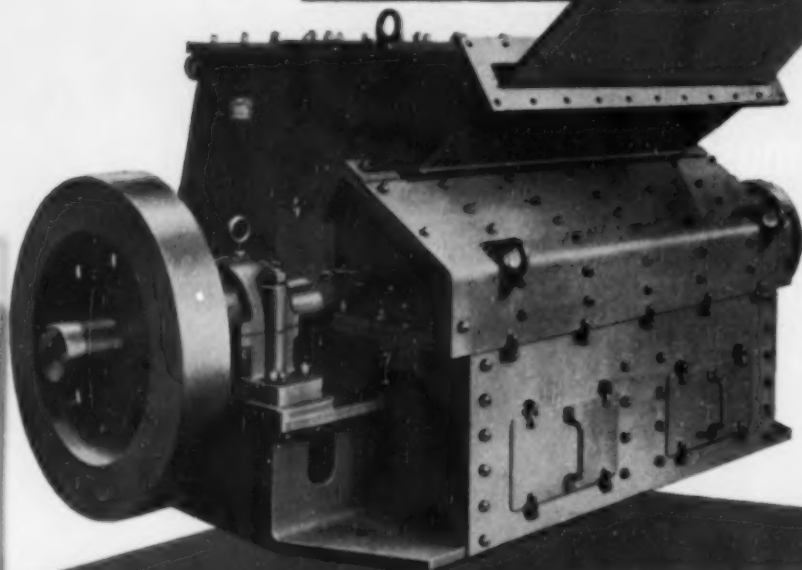
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for Heavy Duty  
and large ca-  
pacities with  
special Feed  
Chute for these  
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tions.

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*special units for general use — small to large capacities*

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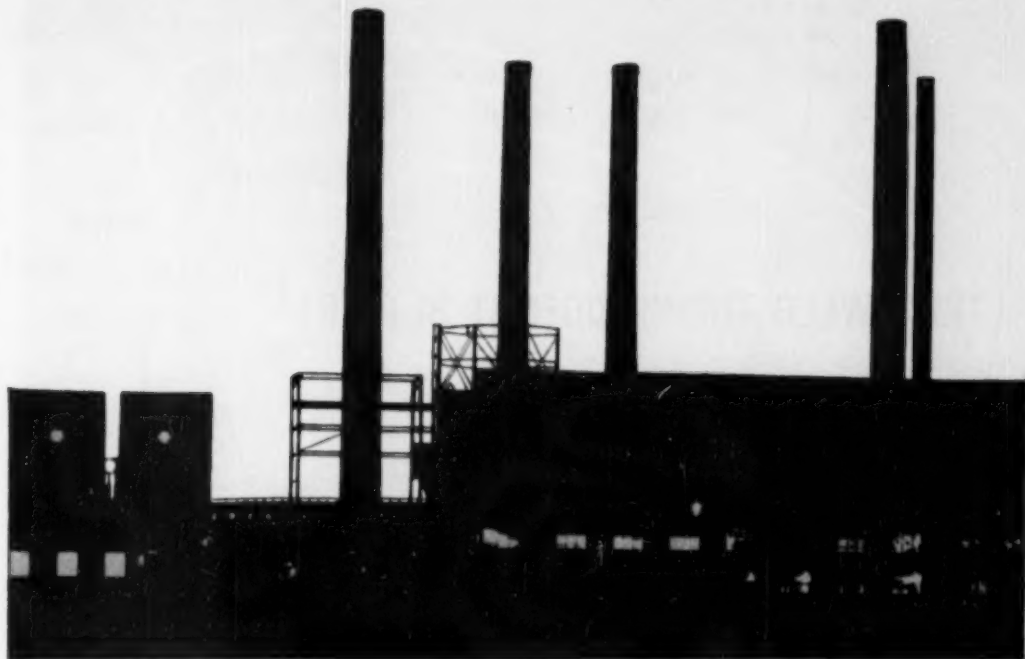
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Complete Line of  
Material Handling,  
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## Does your plant use surface active agents?



IF SO, investigate the **ULTRAWETS**—the family of alkyl aryl sulfonates tailor-made for particular jobs. Available in liquid, flake or bead form. We are confident that one of the **ULTRAWETS** will suit your needs—probably more efficiently or more economically than the product you now use.

**INDUSTRIAL AND HEAVY DUTY DETERGENTS**—High density **ULTRAWET SK** and **ULTRAWET K** are outstanding for dry mixing with builders.

**TEXTILE DETERGENTS**—Liquid **ULTRAWET 35KX** is the most economical alkyl aryl sulfonate for volume use. Flake **ULTRAWET K** or bead **ULTRAWET SK** are suggested where dried products are desired.

**WETTING AGENT OR PENETRANT**—The liquid **ULTRAWET 30E**, **ULTRAWET 30DS** or **ULTRAWET 60L** offer a diversified choice of wetting, penetrating, foaming and solubility characteristics. **ULTRAWET DS** is available if you prefer a dry product.

**LIGHT DUTY DETERGENT**—**ULTRAWET SK** is the product for this use—no builders are necessary.

**LIQUID HOUSEHOLD DETERGENT**—**ULTRAWET 60L** is outstanding because of its sudsing and solubility properties.

Regardless of your use, our technically trained salesmen with broad experience in the field can no doubt help you. We'd like to hear from you. The Atlantic Refining Company, Chemical Products Section, 260 S. Broad Street, Philadelphia 1, Pa.

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## PETROLEUM CHEMICALS

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Whatever your tubing requirements may be, investigate TRENTWELD. Made in a tube mill by tube experts, TRENTWELD is machine-formed, machine-welded and machine-sized for uniformity. Tested cold rolled stainless sheets are completely fused into finished tubing without added rod metal. Developed by Trent specialists, this method results in tubing that is metallurgically correct, and has a uniform section . . . with no zone of weakness for corrosion to attack.

Our manufacturing methods and modern facilities permit us to supply TRENTWELD Tubing in a complete range of tube sizes from  $\frac{1}{8}$ " to 22" diameter in long lengths or up to 30" diameter in shorter lengths. Whatever your industry,



there's TRENTWELD Tubing to fit your design. Our years of experience as tube specialists is at your call. Write us full details about your application.

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**TRENTWELD**  
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# Monuments of Achievement

Complete plants designed,  
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This 32-page bulletin, containing descriptions and flow diagrams of a variety of industrial processes using DOWTHERM, is available on request.

Write for Bulletin ID-50-1

FOSTER WHEELER CORPORATION • 145 BROADWAY, NEW YORK 6, N. Y.

FOSTER  WHEELER



## What's wrong with this picture?

This man is insulating these exposed water tubes the hard way. He's covering each tube separately, instead of insulating the group as a single unit. When boiler tubes, or any other group of hot lines, operate at the same temperatures and are as close together as these, it takes less time and less material to insulate them as one unit. This method is shown in the small illustration below. It also cuts down the area of exposed insulation surface, thus reducing the amount of heat lost by radiation.

Half sections of pipe covering are used on the outside lines, then all lines are boxed in together with insulating block. Of course, if the lines are spaced too far apart, or if they must be readily accessible for maintenance, each line should be insulated separately.

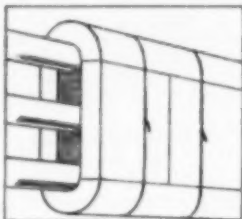
Sometimes whether to insulate piping singly or as a unit may be a pretty

close decision. At other times, the answer may be obvious. But there is always one best way of doing this job, just as there is for every other phase of heat insulation work.

In cases like this, Armstrong engineers are trained to recommend the least expensive and most efficient methods. The complete contracting service they represent also supplies you with top-quality insulation materials and sundries, applied by

skilled Armstrong installation crews.

If you consult an Armstrong engineer the next time you plan a heat insulation job, his advice may save you time and money. His services are always available without obligation. Call the Armstrong office nearest you or write to Armstrong Cork Company, 3306 Maple Ave., Lancaster, Pa.



## ARMSTRONG'S INDUSTRIAL INSULATIONS

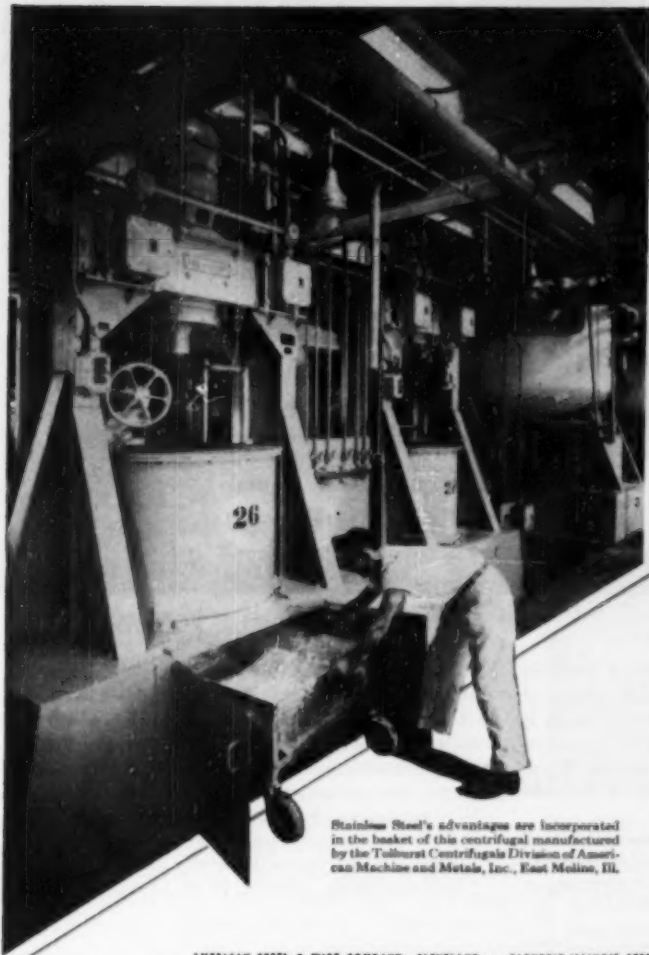
### MATERIALS - INSTALLATION

FOR ALL TEMPERATURES FROM 300° F. BELOW ZERO TO 2800° F.



# Severe Service

## calls for U-S-S Stainless Steel



Stainless Steel's advantages are incorporated in the basket of this centrifugal manufactured by the Tuller Centrifugals Division of American Machine and Metals, Inc., East Moline, Ill.

Nowhere will you find this proved more often and more conclusively than in the chemical processing industry. For here equipment is exposed to combinations of conditions that put it to the toughest test.

Exceptionally high temperatures, unusually corrosive materials, high speed operations, and problems of product contamination are frequently encountered together. But the properties of Stainless Steel make it the ideal material to combat one or all of these conditions.

Quite often it's the only material you can use. But even when some other material seems suitable, Stainless Steel's longer service life, reductions in shut-downs, savings in maintenance and cleaning costs and all-around better performance make it simply poor economy to use anything else.

It's not mere coincidence that the most modern plants—plants with the highest efficiency ratings—are using so much Stainless Steel equipment and constantly are looking for more places to put its advantages to work. And because they know they can count on the finest performance from U-S-S Stainless, many of these plants are careful to specify "U-S-S Stainless Steel" for their new equipment.

This perfected, service-tested material is available in forms, grades and finishes to meet almost every requirement. If you have a problem in equipment design, ask for the assistance of our Stainless engineers. They'll help you select the proper type to assure the greatest benefits from its application.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND • CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH  
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SHEETS • STRIP • PLATES • BARS • BILLETS • PIPE • TUBES • WIRE • SPECIAL SECTIONS

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# SAVE HALF THE COST

True, this oxygen plant high-pressure tower of Alcoa Aluminum represents a healthy chunk of cash. But made of any other suitable metal it would cost 25 to 50% more. That's how Alcoa Aluminum makes substantial savings in exchangers, vessels, towers and piping for sub-zero processes.

Besides squeezing dollars, Alcoa Aluminum boasts amazing strength at low temperatures. 3S alloy, for example, increases 23% in yield strength,

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Aluminum combines high thermal conductivity for rapid filling of vessels and better exchanger efficiencies. Light weight for easier handling and faster fabrication. Corrosion resistance that eliminates constant painting and repairs.

For more information, mail the attached coupon to: ALUMINUM COMPANY OF AMERICA, 1473F Gulf Bldg., Pittsburgh 19, Pennsylvania.

Gentlemen:

Please send more information on aluminum's properties and applications for subzero process equipment.

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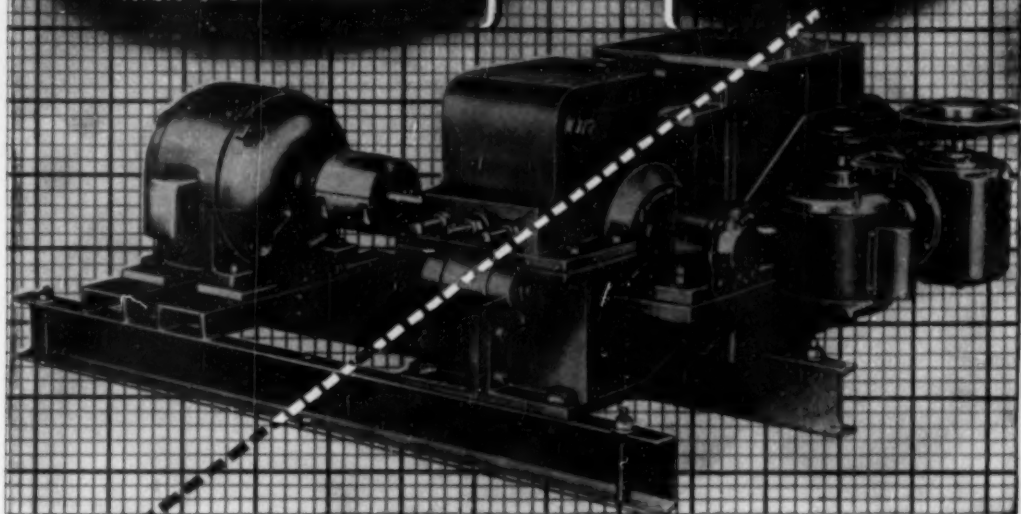
## ALCOA

## ALUMINUM

LONG GRINDING SURFACE  
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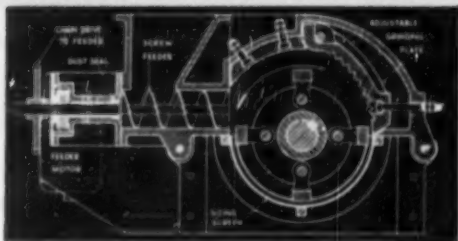
DUSTLESS  
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## WILLIAMS HELIX-SEAL HAMMERMILL

**NO FANS, CYCLONES OR SEPARATORS.** Material fed into screw feeder is discharged at bottom of mill completely pulverized... with no oversizes or tailings to be separated. Screw feeder also acts as a seal against inrush of air. No dust! Williams' Helix Mill grinds many materials to 325 mesh. 100 to 200 mesh products are common on more difficult materials. Yes! It'll grind wet and sticky materials, too! Variable speed control permits grinding of different kinds of materials. **EASY, INEXPENSIVE TO INSTALL AND OPERATE!** Small floor space and lack of vibration calls for simplest of installation. Only requirement is a tight bin below mill with some sort of outlet. All parts are easily cleaned... on most materials simply by brushing. Feeder drive consists of roller chain drive from fractional horsepower gear head motor to feeder screws.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.  
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Sectional view of Helix-Seal Mill. Note long grinding plate against which the material is ground before it reaches the sizing screen. This plate is adjustable to compensate for wear.

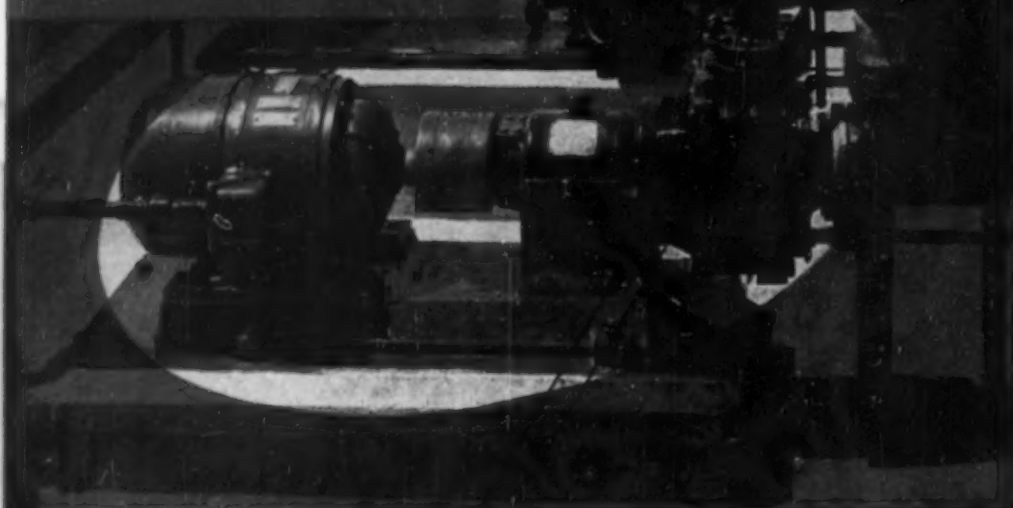
### WILLIAMS ALSO MAKES...

Heavy-duty hammermills; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

# WILLIAMS

CRUSHERS GRINDERS SHREDDERS

# HCl



In a leading Rocky Mountain oil refinery handling gasoline and hydrochloric acid solution, the Wilfley Model AC plastic-lined acid pump shown above delivers 80 gallons of corrosives per minute to a 60 foot head, without leakage and with minimum corrosion.

*A Companion to the Famous  
WILFLEY Sand Pump*

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Performance*

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**T**oday, in every part of the world, Wilfley Pumps move tough-to-handle acids, corrosives, hot liquids and mild abrasives easily and efficiently. Records prove that these pumps deliver substantial savings in production costs. They operate economically and continuously, without attention; they enjoy an enviable reputation for trouble-free performance. Wilfley Pumps are available in 10- to 2,000- G.P.M. capacities; 15- to 150-foot heads and higher. Individual engineering on every application. *Write or wire for specific information.*

## WILFLEY *Acid* PUMPS



# Engineers Report Results in use of Highly Corrosion-Resistant Alloy

**Carpenter Stainless No. 20 Rated "Good" to "Excellent" for Wide Variety of Jobs**



18-8 Stainless

Carpenter Stainless No. 20

Battery filling nozzles for handling 12% sulphuric acid (specific gravity 1.080) at 78-130° F. 18-8 nozzles highly corroded in 2 weeks; no evidence of corrosion on Carpenter No. 20 nozzles after 5 months.

Reports from many users of *Carpenter Stainless No. 20* are giving process and corrosion engineers new information on the types of jobs where this super corrosion-resistant alloy can be used to increase equipment life.

Carpenter first developed methods for processing the cast "Durimet 20" analysis into the wrought forms of bar stock, strip, tubing and wire. Today, Carpenter Stainless No. 20 is also commercially produced in the forms of sheet, plate and clad material.

More complete data on the reports shown here, and additional reports, are available from **THE CARPENTER STEEL COMPANY**, 127 W. Bern St., Reading, Pa.

Export Department: Woolworth Building, New York 7, N. Y. "CARSTEELCO"

To THE CARPENTER STEEL CO., Reading, Pa.

Please send a copy of the Bulletin describing Carpenter Stainless No. 20.

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## Corrodent

## Remarks

5% and concentrated sulphuric acid for water treating equipment.

Excellent results in handling  $H_2SO_4$  at room temperature. Replaced Type 316 and plastic coated equipment.

0 to 40% sulphuric acid for clay processing by activation.

Solution contains silica abrasives. Temp. 120 to 160°F. No. 20 in service 14 months giving excellent results. Replaces lead covered steel and stainless Types 304 and 347 for agitator shafts and blades.

Hydrogen sulfide—saturated solution at 90°-120°F.

Pumps handling oil field salt water. Impurities calcium chloride and sodium chloride. No corrosion evident after 6 mos. service.

Acid mine waters.

Dewatering screens now have greatly increased life, compared with other stainless steels used.

Sulphuric acid—various concentrations.

Superior corrosion resistance for precision metering pumps. Parts previously made of porcelain or special nickel-base alloys. Good machinability of No. 20 also important.

28% sulphuric and 4.5% nitric acids (120° F. max.). Nitrogen trioxide present.

No. 20 replacing high-silicon cast iron for shock resistance. Rated very good after 2 years' service.

Carpenter Stainless No. 20 is licensed under patents of The Duriron Co., Inc.



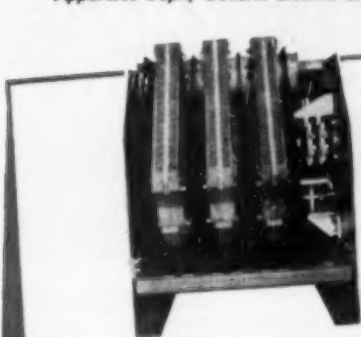
# NOW! 5000V in 34"

## NEW SMALLER G-E LIMITAMP AIR-BREAK CONTROLLER

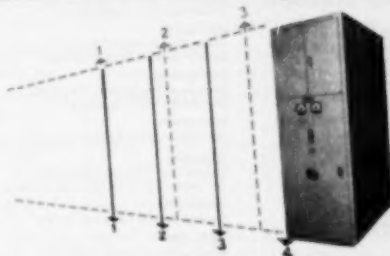
Only 34 inches wide—including enclosure—as contrasted to the previous 52, yet capable of controlling 840 more volts—that's modern design exemplified in this new high-voltage control for motors up to 1250 horsepower.

G-E developed EJ-2 fuses, providing quiet, fast-acting short-circuit protection are enclosed in a compartmented steel cabinet with the new, low-inertia air-break contactor. All the control you need for motors (even those on rapid duty cycle) is engineered, assembled, and tested in our factories to save you layout, installation, operation, and maintenance costs.

Write for more information in Bulletin GEA-5409. This includes descriptions of oil-immersed Limitamp control, reduced-voltage, two-speed, and reversing forms as well as the new full-voltage air-break controller. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.



**MORE VOLTAGE** New air-break design increases the maximum rating from 4160 to 5000 volts.

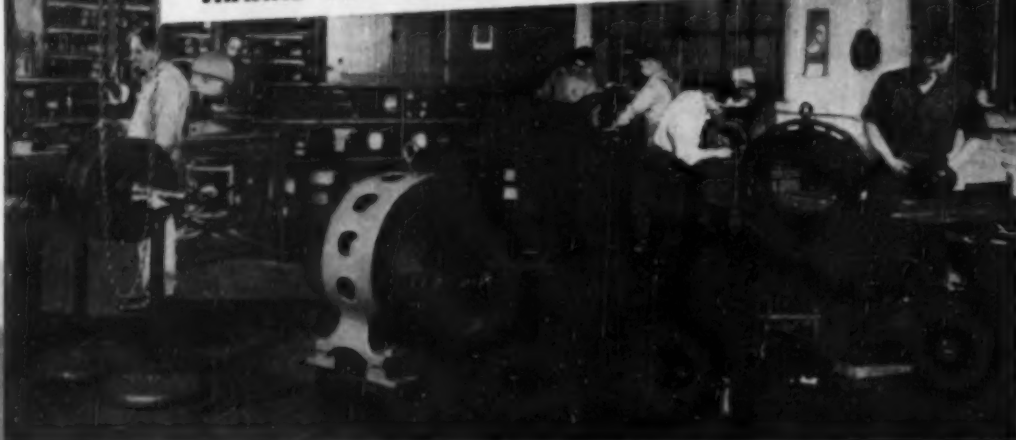


**LESS SPACE** Width of cabinet is reduced, so now, four air-break controllers can occupy the space formerly taken by three.

GENERAL  ELECTRIC

NO DOWNTIME  
THANKS TO

# 36 Hr. Service!



A GROUNDED 200 hp motor recently put a large press out of commission for a midwest steel-tank firm. Dietz Electric, A-C Certified Service Shop, picked up the motor Saturday a.m. The stator was rewound and the motor back on the press in 36 hours — with no lost production time!

GET, FAST, RELIABLE SERVICE like this wherever your plant is located from your nearest A-C Certified Service Shop. There are 80 of these shops in every major industrial area in the U. S.

These independent shops are hand-picked for fine workmanship, high business standards, and excellent fa-

cilities. Their work meets factory-established standards.

When you need new motors — or matching control — call your nearest A-C Certified Service Shop or Authorized Dealer.

A-1067

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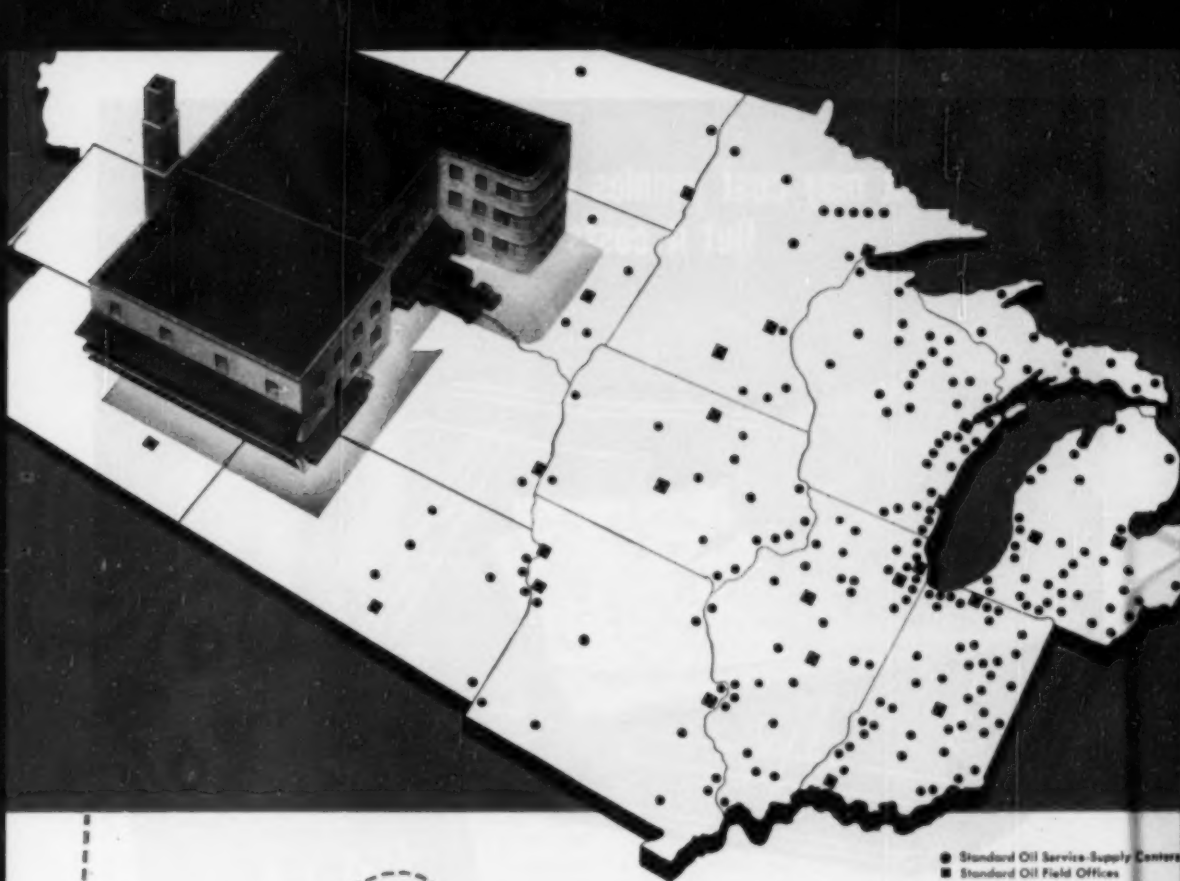
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## Right in your own back yard!

### 3 IMPORTANT ADVANTAGES

Standard Oil's Lubrication Service is especially geared to serve your midwest operations.

- 1 Service-supply points are near your plant. You are assured of fast deliveries, prompt lubrication engineering service.
- 2 Lubrication specialists have been specifically trained in Standard Oil Lubrication Engineering Schools to help you obtain the maximum benefits from lubricants and fuels.
- 3 Research and technical facilities are geared to help solve your specific lubrication problems.

● If your plant is in the Midwest, you can benefit from a service-distribution set-up that is unique in the oil industry—there's a Standard Oil office and warehouse practically right in your own back yard. The nearness of that service-supply center holds important advantages for you.

**Faster Deliveries.** You needn't worry about production delays caused by late shipments of necessary lubricants and fuels. You can avoid the expense and trouble of stocking large quantities of lubricants and fuels within your plant.

**A Complete Supply.** Every lubricant and fuel necessary to the efficient operation of your plant will be carried in the warehouse at your nearby Standard Oil service-supply center. You can always get the product you need *when* you need it.

**On-the-Spot Engineering Service.** Your nearby Standard Oil service-supply center is headquarters for a Standard Oil Lubrication Specialist who is assigned to your plant. He is close at hand to give you help when you need it. He has plenty of practical experience. He has been specially trained for his job in a Standard Oil Lubrication Engineering School. He is backed by Standard Oil's extensive research and technical facilities.

To arrange for his visit, phone your nearby Standard Oil service-supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**STANDARD OIL COMPANY (INDIANA)**



It may cost pennies more in the can . . .  
But it costs dollars less on the tank



**T**HERE's only one sensible way to measure cost when you buy paint to protect a 10,000 gallon tank from corrosive attack, and that's *cost per year per square foot of protection*. A 10% saving in cost per gallon in the can doesn't mean a thing if the paint fails on the tank. More coverage per gallon is just another headache if the paint film on the tank is "protection thin."

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That's why you'll find chemical plants with low cost maintenance records use Tygon Paint almost exclusively: to protect concrete or steel tanks, structural steel work, walls, ceilings, and machinery and equipment exposed to corrosive fumes. They know the few cents more per gallon means dollars less per year.



This booklet points the way to lower maintenance costs. Tells you where, when, and how to use Tygon Paint. It's years for the asking. No cost. No obligation. Write for Bulletin 712, Plastics & Synthetics Division, Dept. CE 650, The U. S. Stoneware Co., Akron 9, Ohio.



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PLASTICS & SYNTHETICS DIVISION

# THE Chemementator

Reg. U. S. Pat. Off.

## COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

*Prepared under the editorial direction of Joseph A. O'Connor, News Editor*

### **AEC explores new chemical process**

U. S. Atomic Energy Commission plans to try out a new chemical process in a \$500,000 pilot plant, to be built at the Wabash River Ordnance Works in Indiana. If the process works, AEC will shell out about \$5 million for large-scale facilities at the ordnance plant. Their construction, which might begin this summer, will take 18 to 20 months.

Girdler is completing studies on the feasibility of the process. No radioactivity will be involved in the operations. Operation of the proposed plant will require fewer than 30 employees.

### **Chemical consumption hits record high**

Industrial chemical consumption rocketed to an all-time high in March, with *Chemical Engineering's* consumption index at 255. Previous high was in March 1948, when the index reached 242. For industrial chemical consumption, the first quarter of 1950 was the second highest on record. Best ever was the second quarter of 1948.

Among major consuming industries that helped most to push chemical consumption to its new record were the fertilizer, rayon, pulp and paper, plastics, and iron and steel industries.

In production of chemicals, another record was set in March, when production of new sulphuric acid topped 1 million pounds for the first time ever.

### **Ashtabula carbide plant closes**

Because of economic factors beyond its control, National Carbide has closed the calcium carbide plant at Ashtabula, Ohio.

National Carbide has been operating the Ashtabula plant since February 1949 under a lease agreement with RFC. Since its construction in 1943, the plant had been operated by National Carbide for the government. Present lease agreement with RFC expires June 28. On that date the plant goes back to RFC.

Built by the government at a cost of \$3.5 million, the plant started operating in September 1943, with calcium carbide for the synthetic rubber industry and acetylene gas as its principal products.

The government has made two attempts to sell, once in 1947 and again in 1949. National Carbide leased the plant on Feb. 1, 1949, for one year, and

renewed the lease on Feb. 1, 1950, but with a 90-day termination clause. What RFC plans to do with the plant now is not known.

Reasons behind the closing were costly freight rates on raw material shipped in from Missouri and finished product shipped to Louisville, Ky., plus the increase in electric power rates. The real stumbling was RFC insistence on \$5 per ton rental. Plant capacity is 75,000 tons a year. Plants built before the war produce at about \$3 less per ton on a plant rental basis.

### **Carbide from waste lime sludge**

Waste lime sludge from carbide production will be used to make more carbide in a \$500,000 experimental plant soon to be built at Louisville, Ky., by National Carbide.

Lime sludge, now a waste product, will be pelletized with coke, and the pellets charged to the huge electric furnaces at the present plant to be converted into calcium carbide. The carbide is reacted with water to produce acetylene gas, which is piped to the nearby synthetic rubber plants of Du Pont and Goodrich.

At present, National Carbide loads its furnaces with commercial coke and commercial lime separately, and as a result lime sludge is wasted. For years the idea of devising a cheap way to get more carbide out of this waste sludge has tantalized carbide manufacturers. Now National Carbide may be coming up with the answer.

The experiment also is an answer, in part, to complaints about dust from residents in the vicinity of the plant. National Carbide officials say that most of the dust results from the handling of lime and coke, and the new process is expected to minimize this nuisance.

### **Possible purchaser for Schering**

A bid to buy Schering Corp., the pharmaceutical firm now held by the Office of Alien Property, will be made by a New York group—if SEC approves.

The plan to buy Schering came to light when United States & International Securities Corp., an investment trust, applied for an exemption under the Investment Company Act. Unless the exemption is (Continued on page 74)



### **THE CEMENTATOR, continued**

granted, International will not be able to buy or hold any of the stock. Other participants in the proposed purchase include certain officers of Dillon, Read & Co., Inc., and the brokerage firms of S. S. Moseley & Co. and Riter & Co.

If the deal goes through, a new company will be organized. It will issue 50,000 shares of stock at \$1 a share. Twenty-five percent of the stock will go to International; the rest, to the Dillon, Read officers and to the two brokerage firms. Proceeds of the stock sale will be used to pay for the Schering stock.

### **Rubber situation**

This year's total industry volume of all rubber products, estimates President Harry E. Humphreys, Jr., of U. S. Rubber, should reach \$3.4 billion, up \$200 million from 1949. Consumption of new rubber, he believes, will total 1,070,000 tons, including 650,000 tons of natural and 420,000 tons of synthetic. This would compare with 575,000 tons of natural and 414,000 tons of synthetic in 1949.

Passenger car tires, except second line grades, have been advanced 24 percent in price, while truck tires have been boosted 5 percent. Whether the price of tires will be jacked up again depends on what happens to the price of natural rubber, currently crowding 35 c. a lb. after its march from about 17 c. last December. "At the current rate of consumption," says Humphreys, "every time natural rubber moves up a cent, it adds about \$1 million a month to the industry's material costs."

Rubber manufacturers see little likelihood of an easing in the tightness of natural rubber. President John L. Collier of Goodrich has recommended that RFC reopen one of its synthetic rubber plants now in standby. He also urged that production of butadiene and styrene be stepped up.

Rubber Reserve reports its present capacity at close to 35,000 long tons of GRS a month. But demand keeps growing and sales are reaching 30,000 tons a month.

### **Allied: a four-for-one split**

One of the last of the blue chips will soon be within the reach of investors of moderate means. Directors of Allied Chemical & Dye Corp., whose common stock is selling in the \$245 to \$250 range, are going to ask stockholders to approve a four-for-one stock split. Stockholders will have their say on the proposal at a special meeting sometime after July 1. Effect of the split will be to broaden the distribution of the stock among investors.

That's in line with the company's new policy. F. J. Emmerich, who took over as president in 1946, is liberalizing Allied's traditionally conservative way of doing things.

Because it concentrated on production of such basic chemicals as acids, alkalis, coal-tar products and ammonia, Allied missed out on much of the tremendous growth of the chemical companies from 1929 to 1949. Although its earnings last year were up 77 percent from what they were in 1939, they were up only 38 percent from 1929. That's considerably less than the other chemical companies show. The reason is simple: profit margins on basic chemicals are lower than in the newer chemical fields.

While other companies expanded their plants and developed new products, Allied put a lot of its earnings into corporate securities and government bonds. At the end of last year, the balance sheet showed cash and marketable securities, carried at cost or less, of about \$117 million. Total assets were approximately \$621 million.

Nor has Allied ever missed a dividend. It made its \$6 annual dividend stick from 1927 through 1936; it has gone higher—but never lower—since that time. Last year, the stock paid \$10.

Since Emmerich took control, research has been a much bigger thing at Allied. The company is going into consumer products—with detergents, insecticides and weed killers. Other new products include chemicals for the plastics industry, new dyestuffs and new compounds for use in fertilizers. Although sales fell off a little in 1949 from the year before, profits jumped from \$32 million to \$37 million.

### **Job outlook for chemical engineers**

Employment of chemical engineers may reach 55,000 by 1960—an average growth of about 1,500 jobs annually. Chemical engineers numbered between 35,000 and 40,000 in early 1948, double the number in 1940. To some extent, the rate of growth may be slowing down, although not as much as in other fields of engineering.

Employment in all branches of engineering, the third largest profession and one of the fastest growing, may increase by as much as 100,000 in the next decade to a total of about 450,000 for the entire U. S. Total demand for new engineers, including those needed to fill new jobs as well as replacements, will approximate 17,000 to 18,000 annually for the next few years. By 1960 the demand may rise to around 21,000 or 22,000 a year. Mechanical engineering, the largest branch, is growing rapidly. But so is chemical engineering.

### **For UAW's Gosser, a flat tire**

Their 90-day strike, fourth longest in Toledo history, ended, 469 workers at the Plaskon Division of Libbey-Owens-Ford are back at their jobs, turning out plastic molding materials. And the once ballooning aspiration of Richard T. Gosser, international vice president of the CIO United Auto Workers, for an area-wide pension plan is punctured—for the time being.

(Continued on page 78)



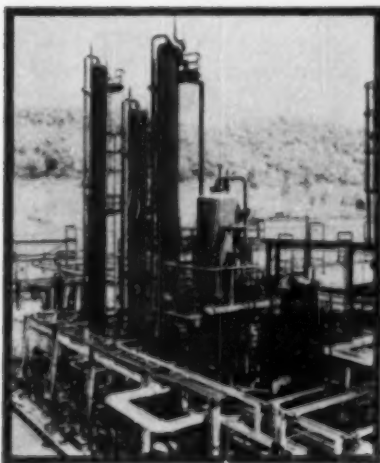
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Photo shows a portion of the installations at Natrium, West Virginia, where Columbia Muriatic Acid is produced.



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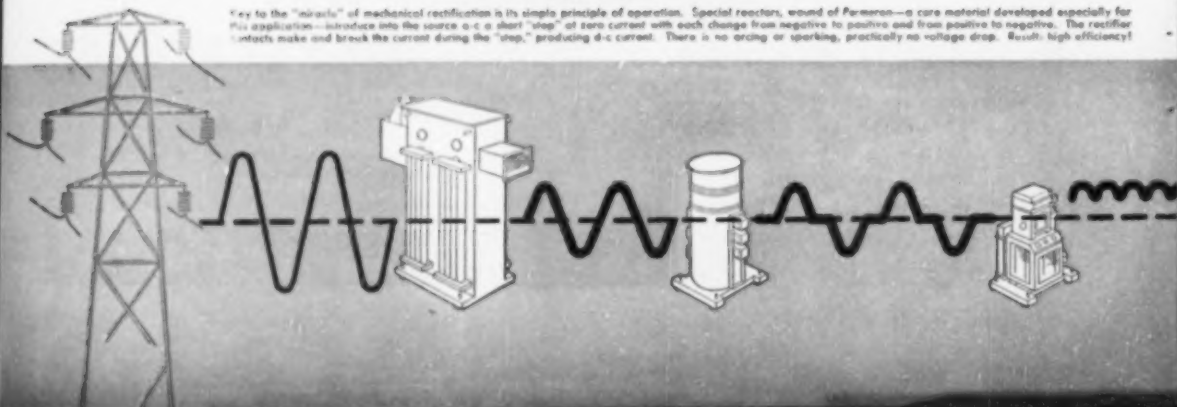
for applications up to 10,000 Amperes per unit at 50 to 400 Volts

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Key to the "miracle" of mechanical rectification is its simple principle of operation. Special reactors, wound of Permeron—a rare material developed especially for this application—introduce into the source a-c a short "stop" at zero current with each change from negative to positive and from positive to negative. The rectifier contacts make and break the current during the "stop," producing d-c current. There is no arcing or sparking, practically no voltage drop. Result: high efficiency!



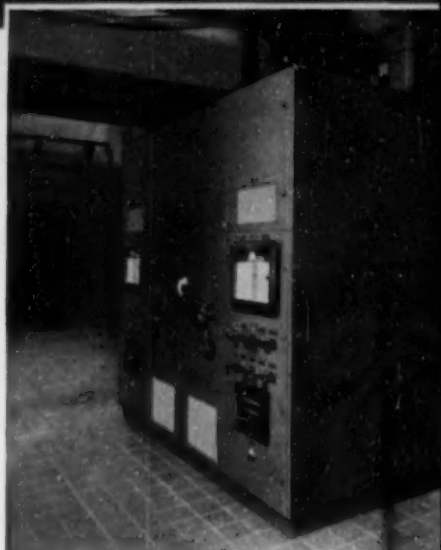
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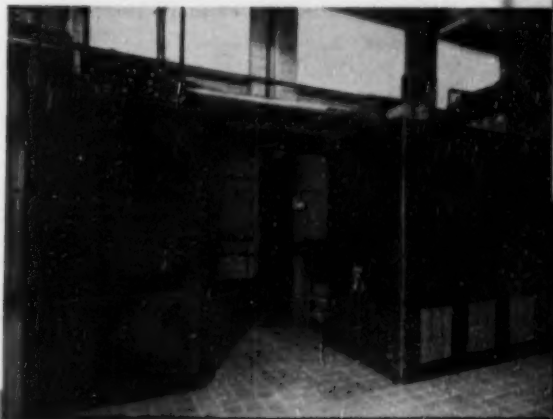
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Control cubicle for rectifier and protective equipment.

Mechanical rectifier and saturable reactor. Note small size and compactness of this installation.

Twin rectifier units (right) and control cubicle (left). Note clean appearance and absence of complicated external auxiliaries.



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## THE CHEMENTATOR, continued

Disciplinary suspension of five production workers by the company precipitated the strike by Local 12 of the UAW-CIO. That issue was soon settled, however. What the union negotiators really were after was the area-wide pension plan conceived by Gosser. But they didn't get it.

Instead, the union settled for an across-the-board pay raise of 10 c. an hr. Other worker gains: a company-financed health and welfare program; retention of premium pay for Saturday and Sunday work; and payment of shop committeemen engaged in union business during working hours. The contract expires May 1, 1951.

Here's the deal that Plaskon turned thumbs down on: Gosser wants the 125 employers in northwestern Ohio with whom the UAW has contracts normally covering about 50,000 workers to kick in to a common fund, to which the employees contribute nothing, enough money to provide \$160-a-month pensions (including Social Security payments) to employees at age 65 with 25 years of service. Years of employment with any of the participating companies would count as credited service. Hence the employee could shift jobs in the area without danger of losing his stake in a pension.

Plaskon has offered to pay the same pension to those 65 with 25 years of service, but refuses to have its plan tied to that of other employers in the area. And this time it has won out. For at the moment Gosser's area-wide pension plan is a flat tire.

### Chemical strikes are countercurrent

Strikes—stemming largely from disputes over wages, pensions and insurance benefits—shot upward last year. The 50.5 million man-days of work lost directly from strikes was the second highest on record. Only 1946's 116 million man-days exceeded it.

Trend in the chemical and allied industries, however, was the other way—downward. Here is what strike figures just released by the Bureau of Labor Statistics show: chemical strikes dropped continuously from 122 in 1946 to 72 last year, while the number of employees involved was less than half—down from 48,100 to 20,000. Only 358,000 man-days of idleness was chalked up, less than a third of the 1946 figure.

### Potash miners to enter CIO Steelworkers?

**CARLSBAD INVASION**—The potash companies at Carlsbad, N. M., soon may have to deal with the powerful CIO United Steelworkers of America, headed by CIO President Philip Murray, instead of the leftish, strife-torn Mine, Mill & Smelter Workers, recently kicked out of the CIO for following the Communist Party line.

The CIO has assigned jurisdiction over mineral mining and smelting to the steel union. It is en-

gaged in an active campaign to take over the Carlsbad miners. Leading the drive is M. J. Soldren, husky USW-CIO international representative headquartered at Pueblo, Colo.

**ELECTION SOUGHT**—Petitions for an election to determine bargaining rights for employees of U. S. Potash Co., Potash Co. of America and International Minerals & Chemical Corp.—the three companies at Carlsbad—have been filed with NLRB by the companies, the steel union and, for special groups of employees, by the International Association of Machinists and two AFL unions, the Chemical Workers and the Electricians. The election probably will take place this month. MMSW's contract expired May 31.

**BAD ACTOR**—Individual workers employed by the Potash Co. of America and International Minerals & Chemical already have initiated actions to decertify MMSW. MMSW violated the Taft-Hartley Law during the 74-day strike at Carlsbad that ended in January, according to findings of NLRB trial examiner C. W. Whittemore. The union was found guilty on 12 counts of mass picketing, coercion, threats and other strike abuses. Neither the international union nor the local, No. 415, showed up for the labor board hearings, held in February.

**NEW DEMANDS**—If the steel union wins at Carlsbad, the potash companies will be confronted immediately with demands for the \$100 employer-financed minimum monthly pension and the jointly-financed health insurance plan the big union won last winter in the steel industry.

Next they will be pressured for a guaranteed annual wage. This was made clear at the steel union's Atlantic City convention last month. Delegates went on record in favor of a guaranteed annual wage as a "primary objective" of the union. The need for it was explained by Murray W. Latimer, the union's pension expert.

Unless there is continuity of employment, Latimer says, workers will lose pension and insurance rights, as well as wages and seniority protection. The "heart and core" of security is continuity of employment; therefore, he concludes, the guaranteed annual wage, which stimulates continuous work, is the heart and core of the entire pension and welfare program the steel union has won in the past year.

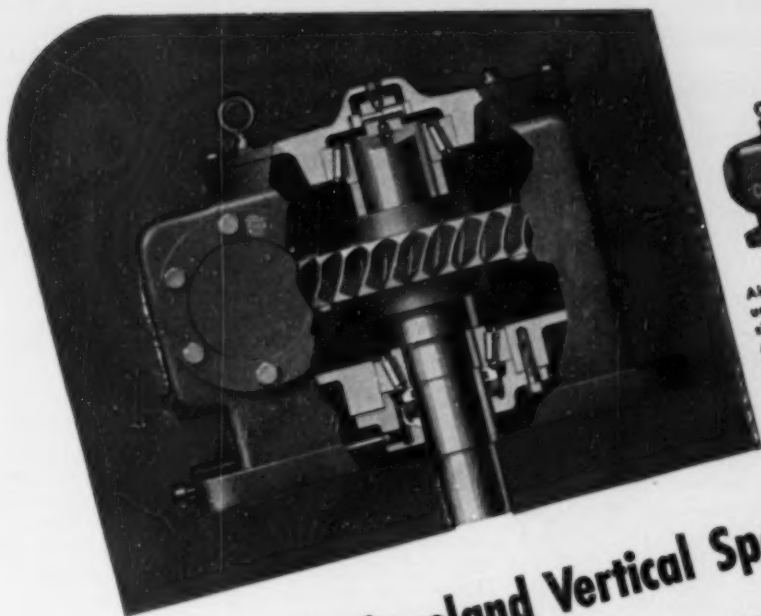
### Wages of chemical workers inch up

Wage increases for most chemical workers were from 4 c. to 6 c. an hr. in recently negotiated labor contracts. A Bureau of Labor Statistics list of 25 contracts covering 18,000 workers in chemical and allied products plants reveals that more than half of the workers —10,430—got that much.

Almost one-tenth of the chemical workers got no

(Continued on page 80)





Above—Exterior view Type ND unit. NU unit (not shown) has slow-speed shaft extending up. At left—Cutaway section to show tapered roller bearings on gear shaft, positive face-type oil seal, unique lubricating pump and oil drain at base of housing.

## A new series of Cleveland Vertical Speed Reducers

• NU and ND worm gear units—in seven sizes each (50 to 500) are ready for prompt delivery. They are particularly suited to such equipment as agitators and mixers, and for use in connection with supplementary low speed spur gear drives, without outboard bearings. Outstanding features which insure that these new vertical drives will deliver long and trouble-free service are:

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## THE CHEMENTATOR, continued

wage increases, but many got added paid holidays, insurance, welfare plans and pensions. Some who were granted wage increases also won some fringe benefits.

### New phosphate plant for Midwest?

Watch for the construction of a new phosphate plant by Food Machinery & Chemical Corp. Most likely location: the Kansas City area.

### Big expansion for Dow in Texas

At Freeport, Tex., Dow Chemical has a big expansion program under way. New construction just authorized by Dow's board of directors is expected to increase production capacity of the Texas division 10 percent, according to A. P. Beutel, vice president and general manager of the division.

Major lines to be expanded are ethylene, chlorine, ethylene dichloride, vinyl chloride, perchlorethylene, synthetic magnesite and low-salt caustic. Work on some of the projects will begin immediately and all are slated for completion before 1952.

Dr. Beutel reports that construction of the big ammonia plant, which began seven months ago, is going forward on schedule, as is work on a synthetic latex plant.

This Freeport latex plant will supplement production of the material at Midland, Mich., where Dow's large latex plant, damaged recently by an explosion, is being rebuilt with increased capacity. Both the Freeport and the Midland latex plants are to be completed early this summer. Both are designed to prevent possible duplication of the circumstances that led to the Midland explosion.

### Synthetic fiber plant for Texas City?

Any immediate building program at Texas City is denied by Monsanto. Nevertheless, ground next to the present styrene plant is being filled in and rumors persist that the long expected construction of a plant to make Chemstrand, the new synthetic fiber, made from acrylonitrile, will be started soon. Its rumored cost: about \$35 million.

Chemstrand Corp., a new company jointly owned by Monsanto and American Viscose, developed the fiber and is exploring its commercialization.

### New potash producer

First of two shafts on its potash holdings, which are 23 mi. from Carlsbad, N. M., and north of the mines of Potash Co. of America, is being sunk by Duval Sulphur & Potash Co., newcomer in the potash business (see *Chementator*, April 1950, p. 84). Utah Construction Co. has the contract for the shaft work. Actual plant will cost \$7.5 million, take two years to build.

Duval expects to mine and mill about 720,000 short tons of equivalent  $K_2O$  a year, or between 10 and 15 per-

cent of estimated present total U.S. production. Stearns-Roger of Denver, Colo., has the contract for engineering design of the refinery. Duval plans to use the sylvite flotation process.

### From dead timber, a live new pulp industry

Construction of its \$20 million pulp and newsprint mill in western Colorado, Columbine Development Co. discloses, is slated to start in a few months (see *Chementator*, Jan. 1950, p. 74). Ebasco Services will participate in engineering design and construction. Best estimate of the mill's capacity: 200 tons a day. It will be located along the Colorado River between Rifle and Glenwood Springs.

"Ownership of the company is entirely in the hands of residents of western Colorado," reports Preston Walker, president of Columbine. For over a year his organization has been working toward three goals: (1) to put the water of the Colorado River to work for industrial purposes; (2) to utilize the millions of cords of dead timber from the forests of Western Colorado—timber killed by beetles; and (3) to stake western Colorado to a new industry with a payroll of more than \$2 million a year, a pulp industry that would boost population in the area by some 8,000.

Earlier this year Mr. Walker went to Washington, where he submitted at a U.S. Forest Service auction Columbine's winning bid on 4.5 million acres of the dead Engelmann spruce in Colorado's White River National Forest. This sale of timber, biggest ever negotiated by the U.S., gives Columbine enough spruce timber to keep its new mill running for more than 30 years.

### Plastics production climbing

"There are indications of a 10 percent increase in production of plastics raw materials for 1950," observes President Horace Gooch, Jr., of the Society of the Plastics Industry. "On an over-all industry-wide basis," he says, "production of these materials, it is now estimated, will approximate 1,650,000,000 lb. for the year."

### Hidding heavy crudes of sulphur

Union Oil Co. of California may construct a coking unit and hydrosulphurization plant in California's Santa Maria valley, where heavy crudes, high in sulphur, are produced. Such crudes would be coked. Then the coker distillate would be catalytically hydrogenated. Thus the sulphur content of products made from the distillate would be reduced.

### Dixie's booming pulp and paper industry

Paperboard production in the South is about 6 million tons a year and pulp output is much higher. The South has quadrupled output since 1935. It now makes over half of the pulp and more than a fourth of the paperboard produced in the U.S.

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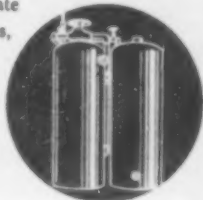
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In oil well drilling muds, for controlling the viscosity and thixotropic properties



As a water softener



In the manufacture of coated paper



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As a dispersing agent in the manufacture of paints, pigments and ceramics

## GENERAL CHEMICAL DIVISION

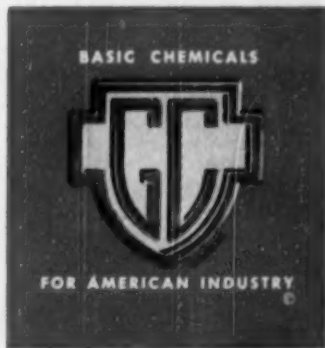
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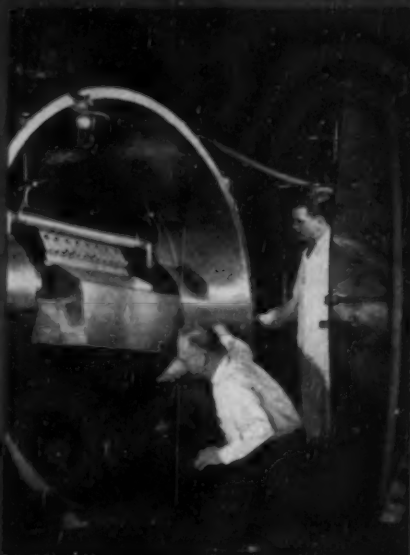
**3 To enable you to pre-test  
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**5 So that you know ... even  
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**6 You are on the right track  
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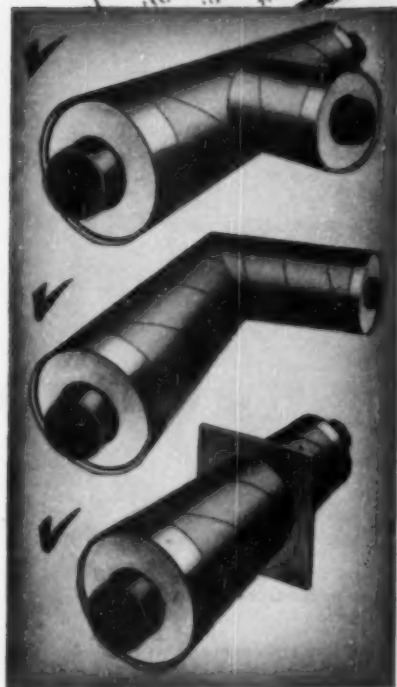
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INSULATED PIPING SYSTEMS

OVERHEAD

THE RIC-WIL COMPANY - CLEVELAND, O.

UNDERGROUND

FOR FORTY YEARS THE GREATEST NAME IN INSULATED PIPING SYSTEMS



**NO MATTER HOW  
YOU LOOK AT IT...**

**THE**  
*Electronik*  
**pH RECORDER CONTROLLER**  
**SUITS YOUR PURPOSE!**

**I**F YOU'RE interested in the chemical treatment of raw water, you're looking for the correct pH value with minimum addition of reagents.

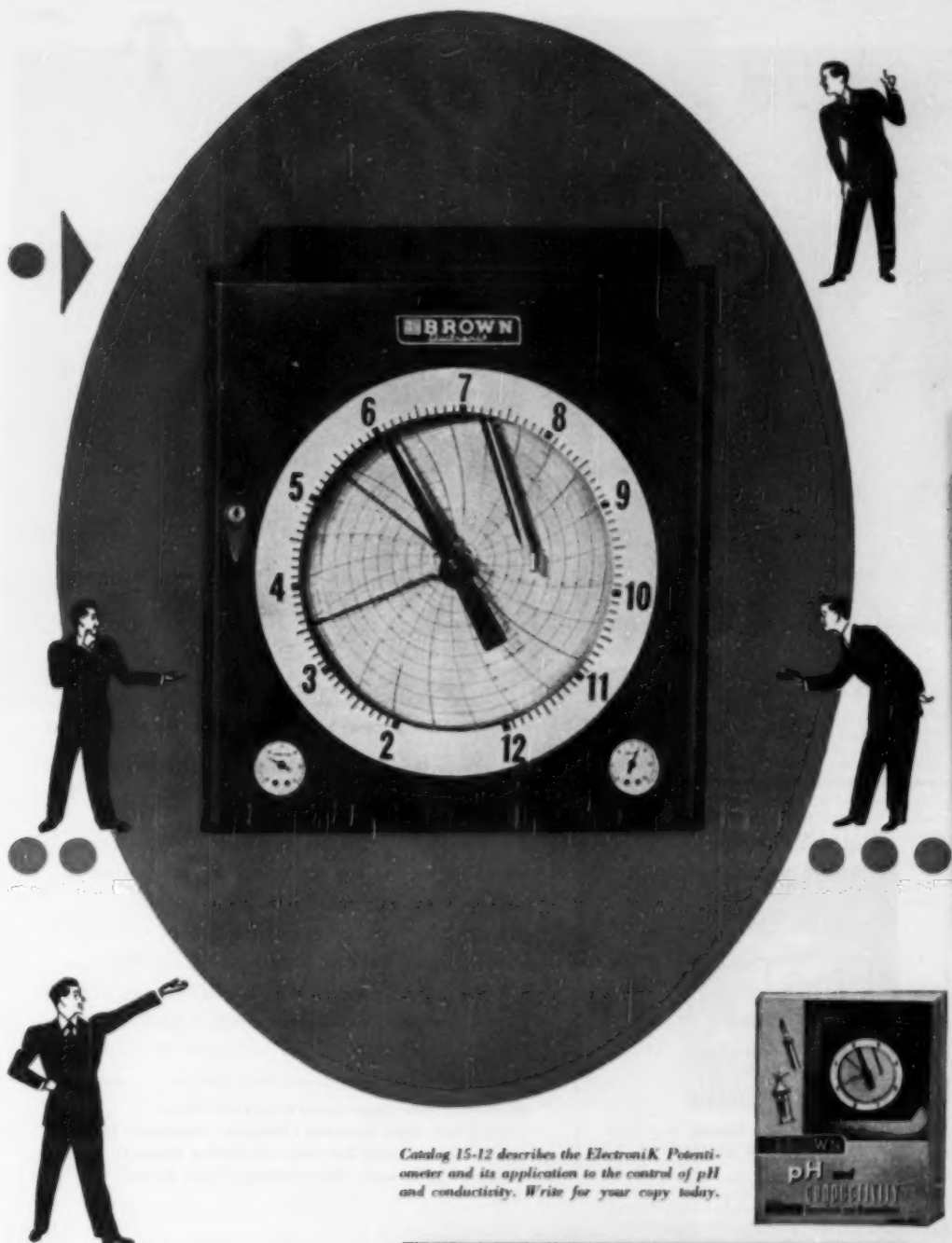
If you're interested in close process control of pH, you want continuous assurance that variations are held to a minimum and that corrective measures are taken care of without delay.

If you're interested in the treatment of industrial wastes, you're concerned with the presence of harmful chemicals which must be neutralized before disposal.

No matter how you look at it . . . the *Electronik* pH Controller suits your purpose . . . for unusual sensitivity to prevailing conditions . . . for accurate and permanent record . . . for rapid response and automatic control action.

Call in your local Honeywell engineer for a discussion of your particular pH application . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Avenue, Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.



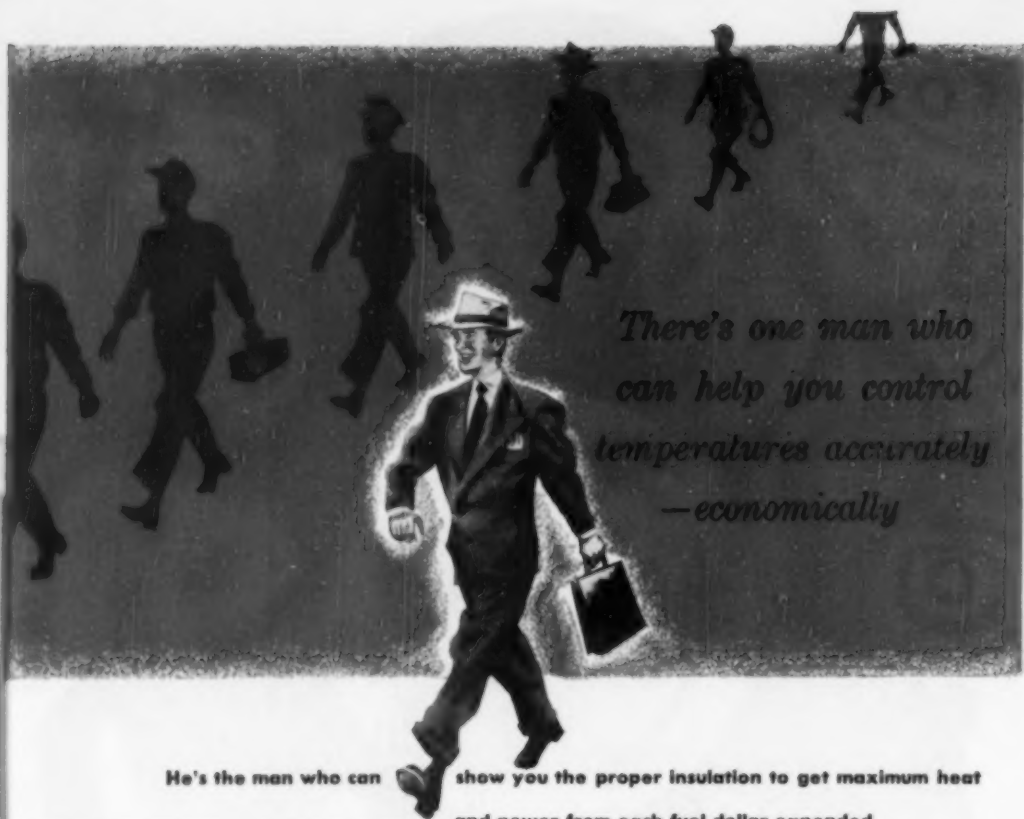
Catalog 15-12 describes the ElectroniK Potentiometer and its application to the control of pH and conductivity. Write for your copy today.



FOR THE CHEMICAL INDUSTRY

MINNEAPOLIS  
**Honeywell**

BROWN INSTRUMENTS



*There's one man who  
can help you control  
temperatures accurately  
—economically*

**He's the man who can show you the proper insulation to get maximum heat and power from each fuel dollar expended.**

*Here's one insulation  
that will save you money*



**EAGLE-PICHER SUPER "66"  
INSULATING CEMENT**

Super "66" is all-purpose, rust-inhibitive, extremely adhesive insulating cement. "Springy ball" pellets don't collapse after application . . . give great coverage, retain their thermal efficiency. 100 lbs. covers 65 sq. ft.—1 inch thick! Easily applied with trowel, over flat and irregular surfaces. Efficient for temperatures up to 1800°F. Reclaimable when used on equipment whose temperatures do not exceed 1200°F.

An Eagle-Picher Industrial Insulation distributor or representative can help you reduce operating expenses because he has available a wide line of insulation products—for high and low temperatures—scientifically designed for maximum thermal efficiency, and practical application. Why not let him give you more information about some of the products listed here?

*These Eagle-Picher products can save you money . . . power . . . time*

**Insulating Felts • Supertemp Blocks • Blankets  
Loose Wool • Pipe Covering • Stalastic • Insulseal • Insulstic  
Swatchek • Finishing Cements • Insulating Cements  
Fireproofing Cement • Diatomaceous Earth Blocks**

**THE EAGLE-PICHER COMPANY**

General Offices: Cincinnati (1), Ohio

*Insulation products of efficient mineral wool—for a full range  
of high and low temperatures. Technical data on request.*



Since 1843

*Get maximum  
fuel savings and exact  
temperature control  
with these versatile,  
efficient insulations*

For a completely effective, low-cost insulation combination, you can't beat the teamwork of Eagle-Picher Mineral Wool Blankets, Supertemp Blocks, Super "66" Insulating Cement, No. 106 Fireproofing Cement and Insulseal. They work effectively to give your equipment highest possible thermal efficiency . . . cut operating costs by saving maximum amount of fuel . . . and help to provide perfect, precise control over temperatures.



#### **EAGLE-PICHER FIREPROOFING CEMENT**

Mixed with water to form a stiff plastic mix for easy application on ribbed lath. Recommended for fireproofing structural steel columns, steel tank supports, skirts and equipment bases. Has high dry coverage of approximately 30 sq. ft. 1 inch thick per 100 pounds. Adds fire protection, patented rust-inhibitor resists corrosion. Tested by Underwriters' Laboratories, Inc.



#### **EAGLE-PICHER MINERAL WOOL BLANKETS**

These blankets satisfy the need for a convenient method of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured between flexible metal fabric. Outstanding physical and chemical stability enables Eagle-Picher Blankets to resist water, steam, corrosive fumes and normal vibration.



#### **EAGLE-PICHER SUPERTEMP BLOCKS**

Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs. per cu. ft.). Can be cut easily with knife or saw to fit off-shaped areas . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700° F. Conductivity at 512° F. approximately 0.43 . . . all standard sizes, from 3' x 18' to 12' x 36' . . . in thicknesses from 1" to 4".



#### **EAGLE-PICHER INSULSEAL**

A tough, weatherproof, protective coating for insulation. For temperatures up to 450° F. Applied as a plastic, its smooth troweling qualities assure uniform coverage, proper thickness. It protects insulation from air infiltration, fumes, rain, snow, vibration, punctures, and withstands severe service, indoors or out. Dries to a smooth, rich black, has a neat appearance on hot or cold surfaces . . . may be washed or painted.

**THE EAGLE-PICHER COMPANY** General Offices: Cincinnati (1), Ohio

*Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.*



Since 1843



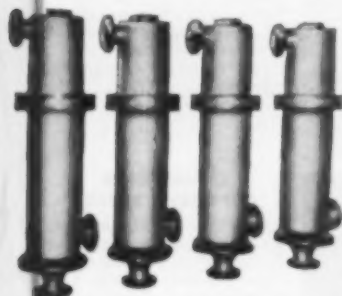
**Pipe Fittings** — Ampco pipe fittings are available in all sizes . . . oils, teas, crosses, reducing fittings and flanges . . . forged, wrought, fabricated or cast — with flanged, welded or screwed ends . . . schedule 10 through schedule 160.



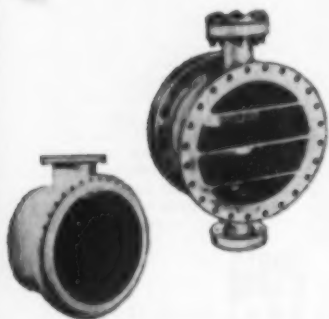
**Process Pipe . . . Prefabricated**  
Ampco alloys selected for resistance to corrosive action of waste liquors. Prefabricated at Milwaukee from centrifugally cast sections, including flanges. Ampco pipe is also available in extruded seamless IPS up to 4" and in larger diameters welded automatically from Grade 8 plate.



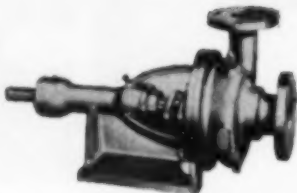
**Conveyors . . . Sulphuric Acid Service** — Ampco alloys selected for top resistance to erosion, corrosion and abrasion for conveyors handling bulk materials saturated with 10% H<sub>2</sub>SO<sub>4</sub> at 210° F. Entire assembly — flights, troughs, shafts, buckets, chain, bearings, etc. — fabricated from Ampco alloys with matching Ampco-Trode electrodes.



**Barometric Condensers and Jet Ejectors** — Ampco alloys selected for high strength, corrosion resistance and ability to withstand high-velocity impingement. Hand-cast venturi welded with Ampco-Trode to centrifugally cast body.



**Heat Exchangers** — Shown above are typical Ampco fabricated exchanger heads. Complete exchangers including tube sheets, tubing, heads and shells made from corrosion-resistant Ampco alloys are available through the fabricator of your choice.



**Ampco Centrifugal Pumps** — Here — for the first time in pump manufacturing history — is a "production-built" and "production-priced" pump to handle acids, salts, alkalies, and other corrosive agents hitherto requiring specially built pumps. The Ampco single stage, single suction centrifugal pump offers long life, high efficiency and low maintenance costs through the combination of correct design and properly selected materials.



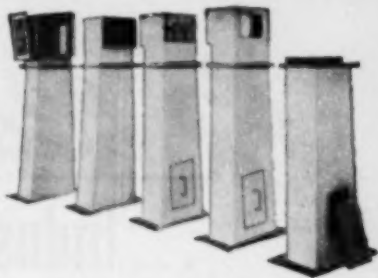
**Corrosion-Resistant Ampco Plug Valves** — Made of properly mated Ampco alloys to combine operating efficiency with extremely long life — under the most severe conditions of corrosion, erosion, cavitation, and abrasion. No pockets to trap corrosive liquid. Available from 1/2 inch up to any desired pressure, in straight-through (2-way) or 3-way, lubricated or non-lubricated types.





#### Fractionating Tower...Acetic Acid

— Ampco alloys selected for resistance to corrosion by acetic and formic acids . . . and for maximum retention of physicals at temperatures up to 500° F. Fabricated of corrosion-resistant Ampco alloys throughout . . . deep-drawn sheet, plate, extruded tubing, centrifugal castings, etc. . . welded with Ampco-Trode 180 electrodes.



#### Chutes . . . Potash Production

— Ampco alloys selected to resist the severe erosive and corrosive effects of the mixture being carried. Fabricated of 1/4" thick corrosion-resistant Ampco 8 plate welded with Ampco-Trode 180 electrodes. No pre-heating or post-heating was required. The weld joints match the parent metal in chemical and physical properties.

**AMPCO**

# Resist Corrosion, Reduce Costs

...with this unique combination of money-saving properties:

1. High resistance to corrosion
2. High tensile strength
3. High physicals at extreme temperatures
4. High weight to strength ratio
5. High impact and fatigue values
6. High wear-resistance — to erosion — corrosion, cavitation, etc.
7. High compressive strength
8. High modulus of elasticity

The long service life of Ampco Bronze Alloys — at a moderate initial cost — offers unusual savings to both designers and plant engineers.

Reduced material failures mean (a) minimum down-time (b) less production loss and (c) lower maintenance costs.

Increase efficiency of design and operation . . . specify Ampco Bronze alloys for handling corrosive and erosive media. Write today for recommendation and complete information.

Ampco aluminum bronzes are available in a number of grades to meet your exact requirements in any form you need: rolled sheet or plate, sand or centrifugal castings, forgings or extrusions . . . pipe and fittings. Also, Ampco's arc-welding electrodes, corrosion-resistant centrifugal pumps and plug valves.

#### Free . . .

Process Industries Bulletin — 16 pages of money-saving information

Fill out this coupon and mail today!

Ampco Metal, Inc., Dept. CE-6, Milwaukee 15, Wisc.

Send me your free bulletin, giving full information on the application of Ampco Alloys in the Process Industries.

Name \_\_\_\_\_

Company \_\_\_\_\_

Company Address \_\_\_\_\_

City \_\_\_\_\_

( ) State \_\_\_\_\_



**Ampco Metal, Inc.**

Milwaukee Wisconsin

West Coast Plant - Burbank, California

# 6 reasons why

## ...Industry after Industry

### has selected the VERTICAL-UNIT BOILER

VERTICAL-UNIT  
C-E BOILERS  
THAT HAVE BEEN  
THE MOST CHOICE

AUTOMOBILE  
BAKERIES  
BREWERIES  
CEMENT  
CHEMICAL  
COLD STORAGE  
DAIRIES  
DISTILLERIES  
FOOD  
GLASS  
HOSIERY  
HOSPITALS  
INSTITUTIONS  
LAUNDRIES  
LEATHER  
LINOLEUM  
MACHINERY  
METALS  
OIL  
PACKING  
PAINT  
PAPER  
RAILROADS  
RUBBER  
SCHOOLS  
STEEL  
SUGAR  
TEXTILE  
TOBACCO  
UTILITY

A glass plant in Ohio . . . a chemical plant in West Virginia . . . a floor covering plant in Delaware . . . plant after plant, representative of virtually every branch of industry, has chosen the C-E Vertical-Unit Boiler, Type VU-10 to meet its particular steam requirements. Here are six important reasons for the VU-10's industry wide acceptance:

**Balanced Design** — Not one or two features for special needs, but a *completely balanced design* that adapts itself to many conditions. A design in which each element is coordinated with every other for top performance.

**Efficient Performance** — The VU-10 has high efficiency over a wide range of output, produces steam of satisfactory quality at all ratings and responds to rapid load swings . . . all characteristics of advantage to many industrial plants.

**Easy Operation and Maintenance** — The VU-10 is simple to operate and maintain — especially advantageous for plants with limited operating and maintenance forces. All parts readily accessible for such cleaning and maintenance work as may be necessary.

**Choice of Fuels and Firing** — In addition to its wide adaptability, the VU-10 permits you to choose the one *best* method of firing for the fuel and load conditions of your plant.

**Lower Cost** — The standardized balanced design of the Vertical-Unit Boiler effects economies in engineering, fabrication and erection which are passed on to you in lower first cost.

**Unified Responsibility** — The Vertical-Unit Boiler is a complete unit . . . boiler, furnace setting, fuel-burning equipment, controls, forced draft . . . bringing you the added benefit of one contract, one guarantee and one responsibility.

The design, construction and operating features of the VU-10 meet all the requirements of a modern industrial plant. Small wonder so many diverse industries select this unit for their steam needs. If your requirements fall within the capacity range, 10,000 to 60,000 lb of steam per hour, it will pay you to investigate the VU-10. Our engineers will welcome the opportunity to discuss the matter with you or your consultants at your convenience.

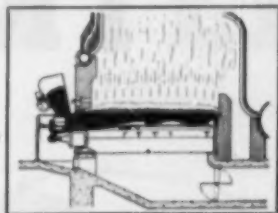
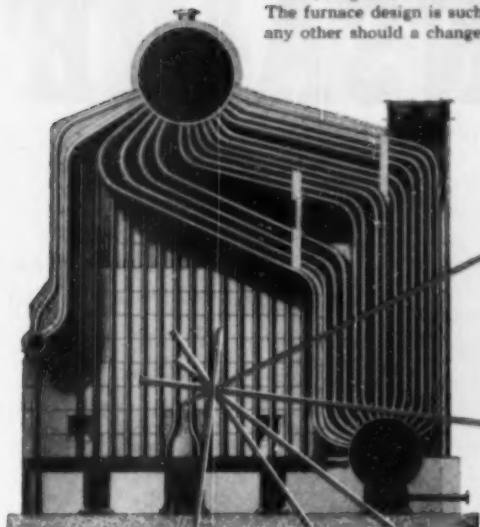
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## COMBUSTION ENGINEERING

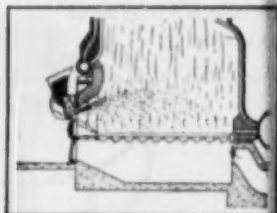
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

For every fuel market and every type of load there is one best method of firing. The selection of that one best method for the fuel and load conditions of a particular plant calls for judgment based on broad experience and free from any incentive to favor one type of equipment over another.

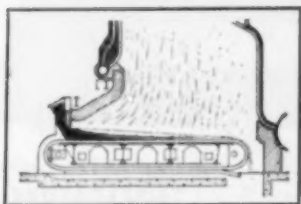
The Type VU-10 Boiler is designed for five methods of firing—spreader stoker, single-retort underfeed stoker, chain grate stoker, oil or gas burners. The furnace design is such that any of these methods may be substituted for any other should a change in the fuel market make it advantageous.



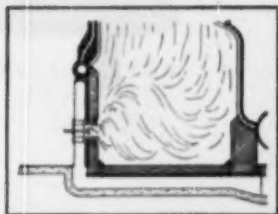
SPREADER STOKER



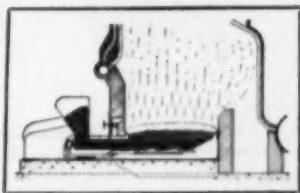
SINGLE-RETORT UNDERFEED STOKER



CHAIN GRATE STOKER



OIL OR GAS BURNERS



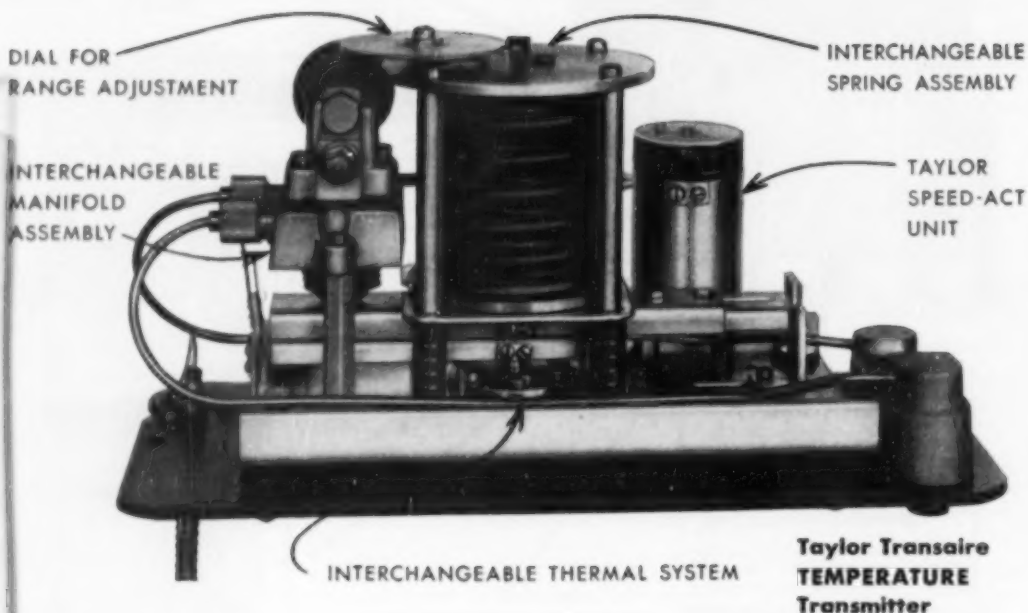
PULVERIZED COAL BURNER

# — SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.



# Already Leading Firms are **TRANSAIRE\***



**T**HAT FIRST FLASH of buyer enthusiasm for new products often dies out quickly. But it's brighter than ever for the new Taylor TRANSAIRE Transmitters—with repeat orders coming in from leading firms the country over.

Until we developed TRANSAIRE Transmitters, measurement of changing temperatures and pressures was always a headache to process engineers. Hundreds of these revolutionary new instruments are now being used successfully by scores of companies. (List available from your Taylor Field Engineer). Whatever your product—TRANSAIRE Transmitters can give you the same precise results.

#### HERE'S WHY:

**1. New Taylor TRANSAIRE Temperature Transmitter with Speed-Act\*** lets you transmit smallest temperature changes up to 1000 feet with unbelievably fast accuracy!

#### GIVES YOU:

**a. Dynamic Accuracy** in measuring changing or dynamic conditions. Transaire Dynamic Accuracy is unparalleled. Solves problem of process engineers who realize that accuracy within a fraction of a degree in measuring static conditions can miss by many degrees when temperature is changing.

**b. Dynamic Compensation**—for inherent lags both in measuring system and rate of heat transfer of process medium. Introduces derivative action (Speed-Act) into measuring circuit. Result—Dynamic Accuracy, with a speed of response seldom thought possible, permitting much closer automatic temperature control.

**2. New Taylor TRANSAIRE Pressure Transmitter with narrow range spans** lets you measure and transmit minute pressure changes up to 1000 feet. Works on simple force-balance principle. Accurate to  $\frac{1}{2}\%$  of the selected short

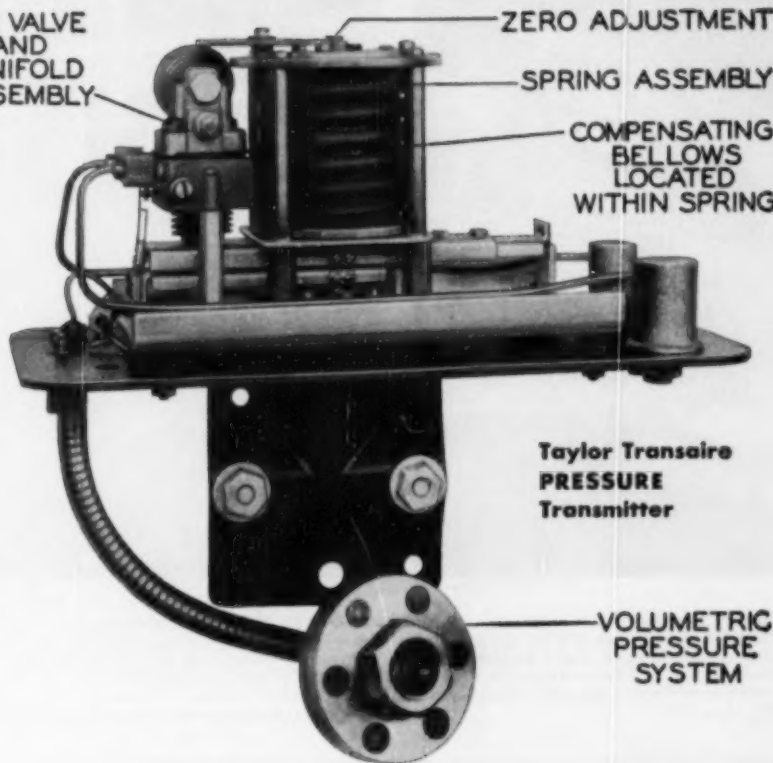
# *re-ordering the new Taylor* **TRANSMITTERS**

AIR VALVE  
AND  
MANIFOLD  
ASSEMBLY

ZERO ADJUSTMENT

SPRING ASSEMBLY

COMPENSATING  
BELLOWS  
LOCATED  
WITHIN SPRING



**Taylor Transaire  
PRESSURE  
Transmitter**

VOLUMETRIC  
PRESSURE  
SYSTEM

range span (conventional devices are only accurate up to  $\frac{1}{2}\%$  of upper range limit). Sensitive to pressure changes of  $\frac{1}{2}$ " water.

**Here are a few important advantages:**

**Range spans** of 20 and 40 psi available throughout range limits of 35 to 415 psia.

**Volumetric type** pressure system is extremely accurate, practically clog-proof, has corrosion-resistant 316 stainless steel diaphragm.

**Temperature and barometric** compensation for higher accuracy of measurement and control.

**For complete details**, write for **Bulletin 98140** on TRANSAIRE Temperature Transmitter, and **Bulletin 98099** for TRANSAIRE Pressure Transmitter. Ask your Taylor Field Engineer! Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

*Taylor Instruments*

— MEAN —

**ACCURACY FIRST**

IN HOME AND INDUSTRY

*Instruments for indicating, recording and  
controlling temperature, pressure,  
humidity, flow and liquid level.*

\*Trade Mark



# Life ...on the



Photo courtesy S. Blumenthal, Inc.

**SEWING QUALITIES** are receiving greater attention in modern textile finishing operations. A number of Cyanamid's finishing oils and soluble waxes are designed to give improved sewing qualities to fabrics as well as softness, suppleness and good hand, thus combining workability and sales appeal, together with wearability.

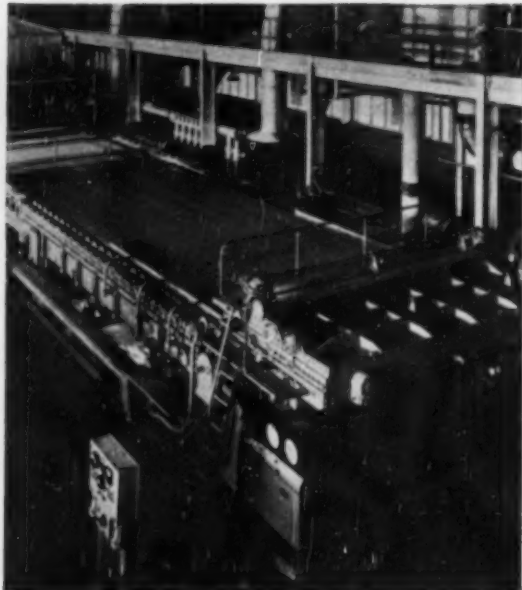
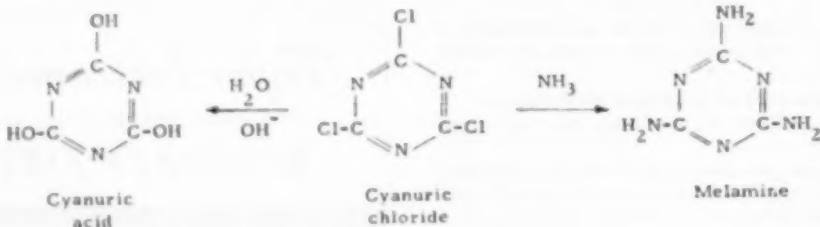


Photo courtesy Paper Trade Journal

**WORK-HORSE OF THE PAPER INDUSTRY** the famous Fourdrinier paper-making machine transforms wet wood pulp into finished paper. Cyanamid's gum, wood, and ACCONITE® Rosin Sizes impart ink resistance to paper, adapting it to writing and printing; and they improve its water resistance. Cyanamid's complete line of paper chemicals makes it a recognized source of supply for the paper industry.



**CHEMICAL FORMULA FOR CYANURIC CHLORIDE** (center) shows its close relationship to cyanuric acid and melamine. This highly reactive intermediate has been suggested for use in the synthesis of pharmaceuticals, explosives, rubber chemicals, surface-active agents, and in textile and fluorescent dyes for

laundry soaps. Other potential uses are under investigation by Cyanamid's New Product Development Department, and pilot-plant quantities are available. For full information on chemical and physical properties, send in the coupon.

# Chemical Newsfront

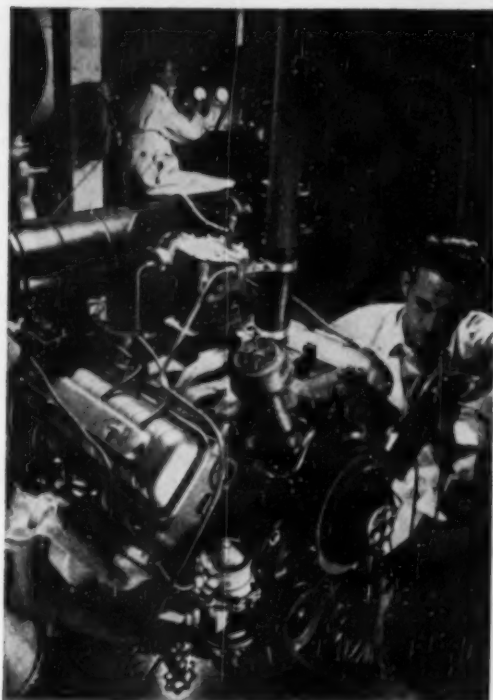


Photo courtesy General Motors Corporation

**TO MEET THE NEEDS OF MODERN** high-compression engines, Cyanamid has developed the efficient AEROCAT® Synthetic Fluid Catalysts for use in the production of top-grade gasolines. In modern fluid cracking techniques, these catalysts, including the MS or "Micro-spheroidal" form which represents the latest advancement in this field, today make possible refining operations that were unthinkable a few years ago. Working in cooperation with the petroleum industry for many years, Cyanamid has developed a number of important petroleum chemicals such as AEROLUBE® Additives for regular, premium and heavy-duty motor oils, AERO® Stearates for grease-making, Gasoline Dyes and Drilling Mud Chemicals.

\*Trade-mark



Photo courtesy The Borden Company

**SPEED UP OF BOTTLE-WASHING** in bottling plants is now being effected with AEROSOL® Wetting Agents used in conjunction with the usual caustic soda wash. Because of their remarkable ability to lower surface and interfacial tension, AEROSOL Wetting Agents accelerate countless industrial processes.

American Cyanamid Company  
Industrial Chemicals Division  
30 Rockefeller Plaza, New York 20, N. Y.  
Please send literature or further data on the products checked:

- |   |   |
|---|---|
| <input type="checkbox"/> AEROSOL Wetting Agents                       | <input type="checkbox"/> AERO Stearates for grease-making |
| <input type="checkbox"/> AEROCAT Synthetic Fluid Catalysts            | <input type="checkbox"/> CYANURIC Chloride                |
| <input type="checkbox"/> AEROLUBE Additives                           | <input type="checkbox"/> Rosin Sizes for Paper            |
| <input type="checkbox"/> NO-ODOROL® Finishing Oils, and Soluble Waxes |   |

Name.....

Company.....

Address.....

C. E. 4-10

## AMERICAN Cyanamid COMPANY

30 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.

# ANOTHER *Traylor*

## ROTARY COOLER

to ease a HOT Production Schedule



Traylor Rotary Coolers, Kilns and Dryers are characterized by the exact combination of rigid shell, floating-type riding rings and cut steel driving gear. Improved supports of the best type for each installation are adjustable for easy alignment maintenance. Write today for full information.

Traylor Rotary Coolers reduce cooling time . . . make "too-hot-to-handle" materials fit into close production Schedules. For more than 25 years, Traylor has built Rotary Coolers to fit individual installations. The demands of modern, high temperature thermo-processing are met by four main types which afford precise processing control. Special coolers, using air, water or a combination of both, are built to meet unusual requirements.

Traylor's skill in designing and building rotary equipment is evidenced by the miles of Traylor Rotary Kilns, Coolers and Dryers now in use by successful operators the world over.

We invite your inquiry, either with or without specific details of your processing problem.

**TRAYLOR ENGINEERING & MANUFACTURING CO.**  
155 Mill Street, Allentown, Pa.

Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.  
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.



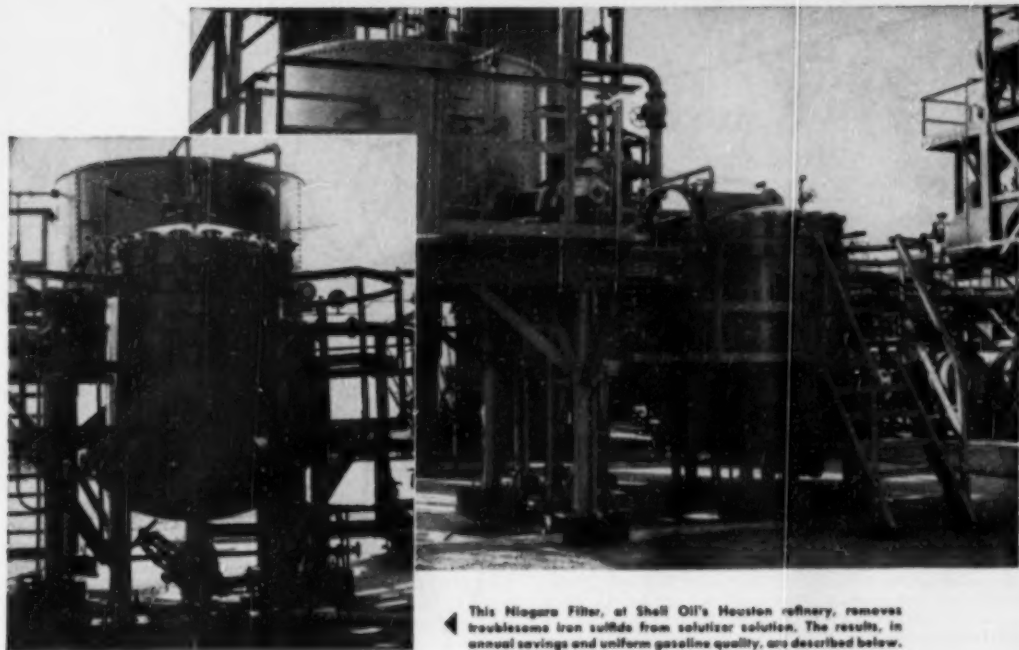
**TRAYLOR**

ROTARY COOLERS · KILNS · DRYERS

GYRATORY · JAW AND REDUCTION CRUSHERS

CRUSHING ROLLS · GRINDING MILLS · FEEDERS

*A "Traylor" Leads to Greater Profits*



◀ This Niagara Filter, at Shell Oil's Houston refinery, removes troublesome iron sulfide from solutizer solution. The results, in annual savings and uniform gasoline quality, are described below.

## NIAGARA FILTER keeps Solutizer Solution "on-stream"

Shell Oil Company uses a Niagara Filter in its solutizer mercaptan extraction process and thereby effects "a significant annual saving."

Caustic solutizer solution is introduced into the extraction system, where it comes into contact counter-currently with the mercaptan-containing hydrocarbon fraction. The treated fraction and fat solutizer solution are withdrawn from opposite ends of the system.

A Niagara Filter was installed to remove the small amount of iron sulfide particles (averaging 20 microns) which gradually accumulate in fat solutizer solution. These insoluble materials in the system act as nuclei for troublesome emulsions and impair the effectiveness of the plant. The iron sulfide is contained in gasoline streams entering the solutizer plant.

The Niagara Filter has 16 stainless steel leaves with a total filter area of 322 sq. ft. It is delivering

solutizer solution free from iron sulfides, at a flow rate of 2700 GPH—and is doing this continually for a period of 64 hours before it is necessary to clean filter.

Continuous filtration helps to keep operation of the solutizer plant at high efficiency. Gasoline production remains uniformly high in octane number and tetraethyl lead susceptibility.

Niagara all-metal filters always save through elimination of filter cloths, simplicity of operation, increased filtration rates and long life of the stainless steel solderless filter leaves. Niagara filtration engineers are experienced in all types of filtration processes. They may be able to help you with your problems, and will be glad to test samples and tell you about pilot filter rental and other services. A letter from you outlining the problem will bring a prompt reply without obligation. Use the coupon below to order Bulletin G-447 for your files.

*Niagara Filter*  
CORPORATION

3087 MAIN ST., BUFFALO 14, N. Y.

NIAGARA FILTER CORP., 3087 Main St., Buffalo 14, N. Y.

Please send me details of Niagara Pilot Plant Filter rental ☐;  
Bulletin G-447 ☐.

NAME

TITLE

COMPANY

ADDRESS

CITY

STATE



## ... in your detergent

**Carbose®** can do it. Carbose is Wyandotte's "detergency promoter." As little as 1% of Carbose added to a synthetic detergent can increase soil removal and whiteness retention properties by 20 to 50%.

Here's what three laundries say about detergents promoted with Wyandotte Carbose:

"We got soft water quality in a hard water plant with a decrease in the cost of supplies."

"We got an outstanding improvement . . . reduced the cost of our supplies by 24.4%."

"Significant increase in quality . . . reduction in cost of supplies 50%."

These are just a few of hundreds of field observations made with different formulations of Carbose with synthetic detergents and builders. We think they show that it might be worth while for you to investigate Wyandotte Carbose. Why not write for samples today?

©Reg. U. S. Pat. Off.

SODA ASH • CAUSTIC SODA  
BICARBONATE OF SODA  
CALCIUM CARBONATE • CALCIUM CHLORIDE  
CHLORINE • HYDROGEN • DRY ICE  
SYNTHETIC DETERGENTS • GLYCOLS  
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE  
PROPYLENE DICHLORIDE  
AROMATIC SULFONIC ACID DERIVATIVES  
OTHER ORGANIC AND INORGANIC CHEMICALS

**Wyandotte Chemicals Corporation**  
Wyandotte, Mich. • Offices in Principal Cities





# Memo from the Editor

## There Is a Human Side

In this issue you will find our new monthly department. We've named it, appropriately I believe, "The Human Equation." It will deal with the human side of chemical engineers and their jobs, with those personality factors that have so much to do with any engineer's success or failure in his profession, and with the technique of handling people in industry.

I recommend Dick Demmerle's "The Human Equation" (page 125) to all of you who feel as we have felt for many years: "Thou shalt not—cannot—live by engineering alone."

## We Want More of Them, Too

A dozen or so times in recent weeks readers have written me along this line: "We like your series of articles on cost estimating; we would like to have more of them."

So would we! Those articles are not so easy to come by. Mostly we have to dig them out the hard way. But maybe some of you have ideas and data that can be worked up into an article (or articles) that would make cost estimating easier, quicker or more accurate for thousands of chemical engineers throughout the process industries.

If you do, why not make your figures and/or formulas available to others? It's one way to give them something you can bank on you'll be remembered by!

## Shakespeare Rewrit

Philip Swain, who is editor of McGraw-Hill's *Power and Operating Engineer*, preaches (and practices) good writing—simple, direct and concise writing. He likes the way Shakespeare did it in *Julius Caesar* and pokes good-natured fun at the way an engineer might have tackled the same job.

Rome might seem a good place to use Latin words, Phil points out. But Shakespeare knew better and made Mark Anthony speak Anglo-Saxon because there was a job to be done and no time for fooling around. Note that Mark had no fear of direct statements, personal pronouns or one-syllable words. Here is Mark Anthony speaking to the mob in *Julius Caesar*:

Good friends, sweet friends, let me not stir you up  
To such a sudden flood of mutiny.  
They that have done this deed are honourable:  
What private griefs they have, alas! I know not,  
What made them do it; they are wise and honourable,  
And will, no doubt, with reasons answer you.  
I come not, friends, to steal away your hearts:  
I am no orator, as Brutus is;  
But, as you know me all, a plain blunt man,  
That love my friends; and that they know full well  
That gave me public leave to speak of him.  
For I have neither wit, nor words, nor worth,  
Action, nor utterance, nor the power of speech,  
To stir men's blood; I only speak right on. . . .

Editor Swain then rewrote into this pointed speech the "faults" of the typical engineering manuscript—long words, long sentences, pussyfooting expressions, passive moods, failure to call the other fellow "you" and your-

self "I." Here are the torturing results. (Reprinted from the *American Journal of Physics*, October 1945):

It is not the intention of the speaker to create in the minds of the friends and other gentlemen present any rapid increase in antagonistic and violent emotions. The persons who sustain the responsibility for this action are gentlemen of substantial reputation. It has not been feasible for the speaker to determine what personal grievances may have impelled them to concur in the action under discussion. However, due to the fact that they are intelligent and of satisfactory reputation, it may be assumed that they will stand prepared to present apparently defensible explanations of their procedure.

It should not be considered to be the intention of the speaker in appearing before you to influence your emotions in such a way as to advance his own personal selfish interests. The speaker is not properly what might be termed an adept in the profession of public speaking, as might be properly stated of Mr. Brutus. It is perhaps not unreasonable to make the assumption that all of the gentlemen here present are acquainted with the fact that the speaker is a person of uncomplicated character and one not addicted to circumlocutions and other types of round-about operations—also that an understandable fondness was maintained by the speaker toward this rather close acquaintance.

Circumstances such as these are entirely familiar to those gentlemen who have accorded the speaker permission to present comments regarding this person. As far as the personal qualifications of the speaker are concerned, his abilities do not include the intelligence, the vocabulary or the character, the procedure, the verbal delivery or the skillfulness in enunciation requisite to the creation of extensive excitement in an audience.

Said Swain: "I tried this experiment to see if putting in 'the faults' would actually make good writing bad. It did."

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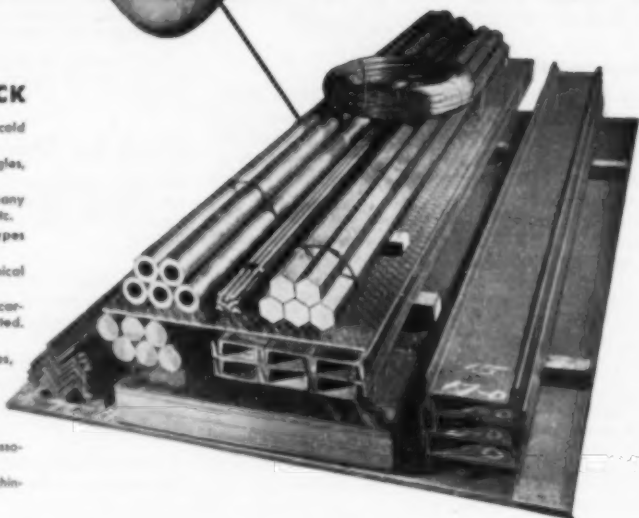
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# Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

JUNE 1950

## The Greatest Story Never Told

When the Synthetic Organic Chemical Manufacturers Association was founded almost thirty years ago, its first great president specified that one of its prime objectives would be to make "a genuine contribution to the future economic independence of America." This he thought could best be achieved by doing a good job of "supplying products of highest quality, in adequate quantities and at reasonable prices." He was certainly right. In the intervening years organic chemicals became our fastest growing industry. Chemical advances are today pacing our entire industrial economy. Had Dr. Charles H. Herty lived, he would have been immensely proud of the contributions of the "organikers" to both war and peace. They have indeed helped to preserve our economic independence.

But now as we enter the century's second half, I wonder what the good doctor would have singled out as our major objective. Would he still feel that good, plentiful, properly priced products are sufficient to insure our economic independence? Or might he not feel that all this has been changed by the tremendous surge of social, economic and political power in the hands of big, controlling government?

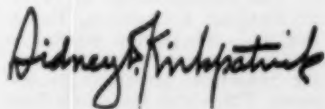
It is my thought that he would counsel all of us to enter the fight for men's minds, to tell our story up and down the land, to stump for something too many of our people are taking for granted, namely, our rights as individuals and as an industry to work in a climate of freedom and opportunity.

As Americans we are known the world over as incurable optimists. But as we watch the tightening of the reins and the cracking of the whip in government's hands, it is my feeling that our optimism may

be of the sort described a hundred years ago by old Artemus Ward when he said: "An optimist is a fellow who don't give a darn what happens, just as long as it happens to somebody else." But what is happening in this country today is not happening just to business and industry, just to Du Pont or U. S. Steel, to General Motors or G.E. It is happening to every one of us.

No single industry better demonstrates the opportunities of a free economy than does the American chemical industry. Its is a story of pioneering, struggle and achievement without equal. It is in truth the greatest story never told. But certainly the time has come to tell it.

For chemical industry as a whole, cooperative work on public relations is essentially a trade association activity and responsibility. Fortunately, some of the groups within the chemical industry have already started to survey feasible methods and means of educating their customers—and the general public as well. But it is a bigger job than any one division of the industry can accomplish. It calls for coordinated effort of all of us—as individuals, as companies, and as an industry. The time has come when for our own good we must talk more about ourselves and the contributions of chemical industry to the security, health, happiness and prosperity of the American people.





## Unique Fertilizer Plant Claims Many Firsts

### FIRST TO . . .

- . . . use wood as a raw material for making ammonia
- . . . use wood producer gas for the steam-iron process
- . . . produce ammonia from steam-iron hydrogen
- . . . use Girbital method for purifying nitrogen for ammonia
- . . . make ammonium sulphate by combination of Mersberg reaction and direct neutralization
- . . . use jet-type absorbers for ammonia and  $\text{CO}_2$
- . . . make chemical fertilizer on a large scale in India

### H. W. VAN NESS

The State of Travancore, India, is the scene of one of the most unusual engineering projects in the chemical process industries. Near Cochin, a modern synthetic ammonia plant has been fighting numerous handicaps since 1947 to supply fertilizers for native rice fields. Placed in operation by Intercontinent Corp. of N. Y. for Fertilizers & Chemicals, Travancore, Ltd., this plant is the first to burn wood as a primary step toward the commercial production of ammonia. The process has already been

briefly described.\* This article gives performance data for more than a year's operation (up to April, 1949).

#### THE PROCESS IN BRIEF

Producer gas made from wood is used directly as a source of nitrogen and indirectly as a source of hydrogen. To form nitrogen, it is burned with air and the flue gas stripped of  $\text{CO}_2$ . To form hydrogen, the steam-

iron process is used; producer gas is cycled through hydrogen generators to reduce the iron after steam has been broken down to form raw hydrogen gas. Table I gives the composition of producer, nitrogen, and hydrogen gases.

Table I—Percentage Composition of Process Gases

	Producer Gas	Nitrogen	Hydrogen
$\text{CO}_2$ . . . . .	6.6	0.5	1.0
$\text{O}_2$ . . . . .	0.2	0.2	0.2
$\text{CO}$ . . . . .	29.0	2.9	1.9
$\text{H}_2$ . . . . .	13.5	1.7	95.4
$\text{CH}_4$ . . . . .	4.2	—	0.5
$\text{N}_2$ . . . . .	46.5	95.6	3.1

Ammonia is made by passing a 3:1 volumetric mixture of hydrogen and nitrogen through five stages of compression, a purification system, back for a sixth compression, and finally through a catalytic ammonia converter.

Ammonium sulphate, the principal end product, is made by a dual process never before used. The first phase is the reactivation of ammonium carbonate solution with native gypsum. The second is the addition of sulphuric acid and ammonia to make ammonium sulphate by direct neu-

\* "West Meets East in Unique Engineering Project", J. K. Van Denburg, Jr., *Chem. Eng.*, Aug. 1947 pp. 22-25.

tralization. Sulphuric acid is made in a contact plant of standard American design. Superphosphate is made by reacting excess acid with phosphate rock.

#### PRIME RAW MATERIAL: WOOD

Wood comes from the forest operations of Forest Industries Travancore, Ltd., on a tract 25 miles up the Periyar river. Due to difficulties of coordinating harvest and transport, there has never been enough wood to keep the plant operating at rated capacity. In harvesting, the large trunks are saved for timber; the by-product firewood of 3-24-in. diameter is the fertilizer plant's raw material.

The trees are mostly hardwoods of various species. Moisture content of all species is about 30 percent when freshly harvested but varies from 10-48 percent as used, depending on the season. Dry samples average 47 percent total carbon, 3 percent ash, 0.05 percent sulphur and 8,200 calories.

India's standard unit for measuring firewood is the volume ton, defined as 3 cu. yd. when stacked in 3-ft. lengths. A volume ton averages 2,000 lb. of dry wood for logs of 6-20 in. diameter but somewhat less for twigs under 6 in. diameter. Average yield per acre of forest is 35 volume tons of firewood. On delivery to the plant, the wood is cut into 18 in. lengths and sent to a 10,000-ton storage building.

#### PRODUCER GAS FROM WOOD

Wood is conveyed to the top of the producer gas plant, where it feeds directly to the charging hoppers of six gas producers (Fig. 1). Early operations of the gas plant were hampered by lack of facilities for cutting and handling wood. Fuel of uniform size and shape gives best results.

Original design of the producer gas plant contemplated the use of soda ash in the cooling tower circulating water. Due to short supply and high cost of this material, only clear water was at first used; the result was trouble from thick tar and carbon deposits in the cooling system and electrostatic precipitators.

Important techniques finally adopted included: (1) build-up of

solids in circulating cooling water to 5-10 percent; (2) control of pH by adding 30 lb. of soda ash per ton of wood burned; (3) more frequent and systematic charging and poking; (4) control of gas outlet temperatures below 500 deg. F. Under these conditions, most of the tar collects in the precipitators as a thin fluid. The yield per pound of wood averages 27 cu. ft. of producer gas of high purity.

#### HYDROGEN FROM PRODUCER GAS

The greater portion of the producer gas is used for producing hydrogen in ten steam-iron generators (Fig. 2). These generators, 12 ft. in diameter, are the largest units as well as the largest installation of their kind. Each is packed with 32 tons of ore, graded from 0.75-2.5 in., in a bed 5 ft. thick. An expensive precalcined iron ore from England was first used; several native ores were later tested. Finally a superior Spanish ore was found. Although this requires rather extensive calcination, it has excellent activity and mechanical properties over a prolonged period. It has an average life of 120 days.

Optimum cycle for operation is 10 min., consisting of 5-min. make and 5-min. reduction followed by a short purge. For normal operation, 135 lb. per min. of saturated steam is admitted above the superheater section during the make cycle, giving an average output of 18,000 cu. ft. per hr. of hydrogen gas. During the reduction cycle, 2,000 cu. ft. per min. of preheated producer gas is admitted to the base of the generator; at the same time air is introduced above the ore bed to maintain the superheater temperature by combustion of unspent gases.

Hydrogen gas thus made goes to a washer where it is cooled and its  $H_2S$  reduced to 0.1 gr. per 100 cu. ft. by circulating cooling tower water of 8.5 pH. For average overall operation, 100 cu. ft. of pure hydrogen will require 400 cu. ft. of producer gas and 28 lb. of steam.

#### NITROGEN FROM PRODUCER GAS

Nitrogen for  $NH_3$  is provided by burning producer gas in air. The flue gas is cooled in a waste heat boiler and scrubbed in a Girbitol system to remove  $CO_2$ . Monoethanolamine is used as the scrubbing agent; its reactivation gives  $CO_2$  of 99.5 percent purity for use in the Merseburg reaction to produce ammonium sulphate. When the demands warrant, additional  $CO_2$  is made by introducing hydrogen generator spent gas through a separate scrubber.

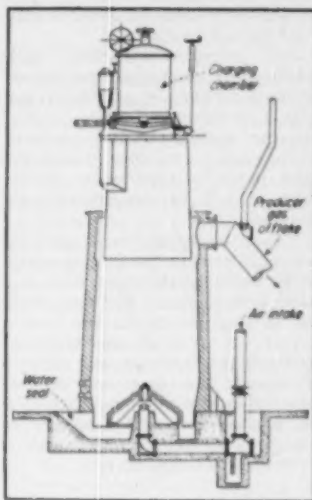


FIG. 1—WOOD GAS GENERATOR

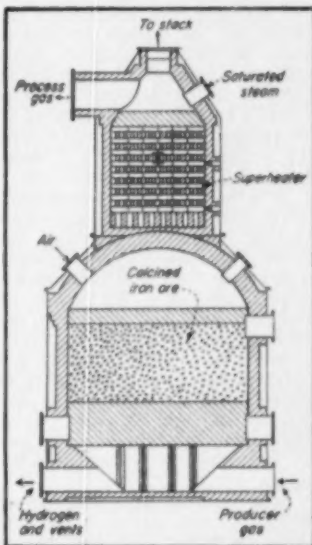


FIG. 2—HYDROGEN GENERATOR

H. W. VAN NESS, now a consultant in New York, was for three years general factory superintendent at the plant of Fertilizers & Chemicals, Travancore, Ltd. Since 1926 he has been associated with the design and operation of major synthetic ammonia projects in this country.



Monoethanolamine solution of 15 percent strength was specified but it was found that sufficient absorbing capacity and lower losses are obtained with a 6-8 percent solution.

For balanced operations, each 1,000 cu. ft. of producer gas burned produces 1,400 cu. ft. of nitrogen gas, 130 lb. of steam and 50 lb. of CO<sub>2</sub>. An equal amount of CO<sub>2</sub> is produced in the spent gas scrubber, making the total steam for reactivation 280 lb. Some 0.15 lb. of monoethanolamine is added.

Gas producing equipment, gas holders, high pressure purification equipment and sulphate driers were supplied from England. The gas holders are of single-lift design and have a capacity of about 20 min. supply of producer gas, hydrogen and nitrogen at capacity rate. In general, the mechanical equipment from England is satisfactory. But electric motors are closely rated and the switch gear is unnecessarily complicated.

#### AMMONIA SYSTEM

Design of the ammonia plant follows the American version of the Haber process except for the high pressure purification system. Hydrogen and nitrogen from the holders are mixed and led through an electrostatic precipitator (designed, fabricated and installed on site) before going to the compressors. A motor-operated butterfly valve is installed in the nitrogen line and controlled from the synthesis control board; it maintains a 3:1 hydrogen-nitrogen ratio.

After the fifth stage of compression, the gas goes to the high pressure purification system for removing last traces of CO and CO<sub>2</sub> by scrubbing with copper formate and sodium hydroxide solutions. This section of the plant gave more grief than any other during start-up. It was finally necessary to completely modify and rearrange the equipment according to standard American practice. The purified gas returns to the sixth stage of the compressors from where it goes to the synthesis system as make-up gas.

Most important piece of equipment in the synthesis section is the converter, a 60-ton solid steel forging with internal parts of type 501M for holding the 5-ton catalyst charge. The original catalyst became badly contaminated during the first six month's operation when there was trouble in the purification section. Since a new charge of catalyst has been put in and leaks in the catalyst basket-interchanger assembly have been repaired by welding, performance has been

satisfactory. A spare set of internal parts of Type 347 stainless has been bought for standby, together with a spare charge of French catalyst.

TABLE II—Total Sulphur Balance

Material	Pounds of S
Wood (0.023%)	1,990
Ash (0.12%)	822
Raw producer gas	1,508
Washed producer gas	906
Producer gas to holder	822
Raw hydrogen gas	861
Washed hydrogen gas	9.9
Washed nitrogen gas	2.9
Mixed gas to compressors	11.7
Purified gas to synthesis	3.3
Product ammonia (1.6 ppm)	1.3
Remaining in synthesis	1.0

Tests were made for sulphur, arsenic and other ingredients in the synthesis and other gases throughout the system. Table II gives a sulphur balance for the entire system for January 1948, when NH<sub>3</sub> production was about 20 tons per day. The average yield of ammonia per 1,000 cu. ft. of 100 percent pure hydrogen was 28.5 lb.

Ammonia goes to the weigh scales, then to one of two 40-ton storage tanks. Two steam-driven reciprocating pumps are provided for transfer of NH<sub>3</sub>, but they have not been used as pressure differential is sufficient in all cases. The present 80-ton storage is inadequate; purchase of a 300-ton sphere is being negotiated. Facilities have been added for loading anhydrous NH<sub>3</sub> into cylinders and 25-percent ammonia-water solution into steel drums.

A 75-ton contact plant of standard American design was provided for supplying H<sub>2</sub>SO<sub>4</sub>. Except for early difficulties with contaminated sulphur, this plant has given little trouble. Since thorough cleaning of the system, design and installation of a molten sulphur atomizer and construction of an auxiliary settling pit for the melter, the plant has produced above design capacity.

#### UNIQUE SULPHATE PLANT

Design of the ammonium sulphate plant is unique since it is a combination process for the manufacture of 75 tons per day by Merseburg reaction and 75 tons per day by direct neutralization. First step in the Merseburg process is the preparation of gypsum. For this purpose, two hammer type primary crushers, a trommel type washer, two rake classifiers, a vacuum dewaterer, a gas-fired dryer and a hammer type secondary crusher were provided. The design called for processing 150 tons per day of crude gypsum of 85 percent purity to give 100 tons of relatively pure calcined gypsum of minus 40 mesh.

Early receipts of gypsum were of inferior quality and serious losses were met in attempting to get the specified purity for reaction.

Recent receipts of gypsum have been kept at 85 percent minimum purity. Washing and classifying equipment has been completely eliminated without harming the reaction or the filtration of reaction slurry. Another important change has been to lower the temperature of the gypsum dryer to give less complete calcination. Losses have now been reduced so that 121 tons per day of 85 percent gypsum gives 81 tons of CaSO<sub>4</sub>, as pulverized gypsum to reaction and 75 tons of ammonium sulphate as 40 percent solution.

Ammonium carbonate solution for the Merseburg reaction is made in a series of four jet-type absorbers for NH<sub>3</sub> and CO<sub>2</sub> gases. The normal strength of carbonate solution is 380 g. per liter; the ammonia-CO<sub>2</sub> ratio is held at 0.8 for best results. During the hot season, most of the NH<sub>3</sub> to process has to be vaporized in coolers to maintain 82 deg. maximum in the carbonate solution.

#### MERSEBURG REACTION

The Merseburg reaction vessels are five wooden tanks 9 ft. in diameter and 9 ft. high, arranged in series; each tank is fitted with a motor-driven agitator. Pulverized gypsum and carbonate solution are fed to the first tank and overflow in series to the last unit from which reaction slurry is pumped to the belt filter. Agitation was greatly improved by putting in four 8-in. baffles on the inside walls of the tanks. Silica and small amounts of unreacted gypsum occasionally have to be removed from the first tank.

During early operation of the 40-in. wide belt filter, the heavy cloth became blanked so fast that operation at rated capacity was impossible. It was necessary to provide loosely woven filter cloth and to prevent double salt formation by maintaining maximum reaction temperature at 120 deg. F. This lower temperature was reached by less complete calcination in the gypsum dryer.

Calcium carbonate filter cake (with clay and other material originally in the gypsum) is repulped and pumped to a storage pit. It is removed during the dry season and sold as a land conditioner.

#### SULPHATE CRYSTALLIZATION

Two 11 ft. 3 in. diameter rubber-lined crystallizers serve to evaporate the ammonium sulphate solution. Part of the heat is supplied by reacting

NHS and  $H_2SO_4$  directly. Each crystallizer has a 6,000-gpm. circulating pump delivering through an external heater to the vacuum evaporator. A jet condenser and vacuum pump maintain a 23-in. vacuum to give a safe operating temperature for the rubber lining.

Difficulties were experienced from the failure of the rubber lining in both circulating pumps. Patching was done, but eventually the damage became so extensive that lead and stainless steel linings were put in. Attempts at lead lining resulted in complete failure; the stainless steel linings (only 16-gage Type 304 was available) gave maximum service of six weeks. Replacement rubber-lined casings from the United States gave much better service, indicating that the lining of the original pumps was probably inferior. Severe corrosion was experienced with the stainless steel impellers of these pumps; analysis showed that type 304 was supplied instead of type 316, as specified.

Experience has shown that about 1 g. per liter of free acidity is required for best crystal formation. When operating the crystallizers mostly on direct neutralization, the crystal bed can be controlled for long periods. But when crystallizer feed is predominantly by solution from the gypsum reaction, the control is more difficult. Large crystals accumulate in the bottom and eventually stop liquor circulation; this necessitates a shut-down for dissolving. Unfortunately, the design of the crystallizer requires that the slurry be withdrawn 18 in. above the bottom.

Two continuous centrifuges have a rated capacity of 90 tons per day each. The bowl and conveyors of these centrifuges, fabricated from type 304 stainless, suffered seriously from corrosion. The conveyors have been rebuilt many times by stainless steel weld metal or Stellite. It is a credit to our machine shop foreman and his staff that replacement gear trains for the conveyor drive were machined, hardened and ground from ordinary material and made to stand service conditions which caused failure of the original gears.

When replacement gears were finally received, the ratios were changed to give a conveyor speed of 34 rpm. instead of 17 rpm. relative to the speed of the bowl. To reduce vibration, the speed of the machines was changed from 1,550 to 1,300 rpm. without exceeding 0.5 percent moisture in the product discharge; 85 tons per day was still the maximum capacity from each machine.

The sulphate dryer was a steam heated, countercurrent rotary type. At rated capacity, the drive motor of this dryer was overloaded, so  $\frac{1}{4}$  of the conveyor flights on the inside of the drum were removed. Result: no adverse effect on drying efficiency. Dust collecting systems were installed in the field to eliminate nuisances around the discharge of the product dryer and at the bagging section. Much of the dust is created by breakage of crystals in the centrifuges.

Average requirements for 150 tons of ammonium sulphate per day are 225 vol. tons of wood to give 40.5 tons of  $NH_3$ , or 33.3 tons of nitrogen, 21 tons of sulphur to give 60 tons of  $H_2SO_4$ , or 58.5 tons of  $SO_2$ , 121 tons of 85 percent gypsum to give 97 tons of  $CaSO_4 \cdot 2H_2O$  or 60 tons of  $SO_2$ . Yields are: 92.5 percent on  $SO_2$ , and 95.5 percent on  $N_2$ . Byproduct  $CO$ , was 26 tons daily.

#### SUPERPHOSPHATE PLANT

Construction was started in 1949 on facilities for producing superphosphate. Process equipment available in India was used. High quality, Moroccan phosphate rock (34%  $P_2O_5$ ) was obtained. Operations were started in April 1948, and the production rate ultimately reached 50 short tons per 24 hr. This required 30 tons of phosphate rock ground to 60 percent through 200 mesh and 20 tons per day of sulphuric acid diluted to 54 deg. Be. After 15 days in the curing pile, the average product analyzed 17.5 percent  $P_2O_5$ .

A new plant of American design is now being installed; it will have a rated capacity of 100 tons in 8 hours. This plant has a mechanized den with mechanical cutter and conveyors for delivering product to the curing pile. Facilities are provided for grinding, screening and bagging. If desired, the same equipment can be used to ammoniate the product with 3.4 percent by weight of ammonia or to blend with other fertilizers.

Rated capacity operations require about 45,000 lb. per hour of steam, 6,000 gal. per min. of process water and 3,500 kw. of electrical energy. Steam is supplied at 100 lb. pressure by three 30,000 lb. oil-fired boilers. Condensate is used in all waste heat boilers throughout the plant; 70 percent of the feed water to the main boilers has to be made up from raw water. A smaller Lancaster fire tube boiler is being installed for burning tar, saw dust or bark.

Three 5,000 gpm. pumps, ten sand filters and a chlorination system are installed for supplying process water.

Due to serious corrosion of cooling equipment, lime has been added to the water; results are indifferent.

#### PLANTS AND PEOPLE

Since the start of operations, more than 2,000 engineering changes have been put into effect. These involve alterations and additions of major and minor importance. The design of most of these changes was developed at site; fabrication and installation was performed by the plant maintenance organization. Operations have been favored by providing a well equipped machine shop with skilled artisans in all crafts. This is important on a project far removed from sources of supplies and spare parts.

First operations of the producer gas section were started in January 1947; the first ammonia was made in June 1947. Rated capacity of the ammonia plant was reached in June 1948; that of the sulphate plant in July 1948. These rates could not be kept up because of insufficient working capital. The process as originally designed, together with early changes, is workable and technically sound.

A total of nine American and English technicians were provided. They arrived on site from eight months previous to two months after start of operations. Although two of the Indian supervisory staff had been connected with the project in the United States there was no program for giving key members of the Indian staff training and experience in similar foreign plants. By April 1949, only the writer and F. N. Chirico remained among the foreign technicians; all other supervisory posts had been capably filled by Indian personnel.

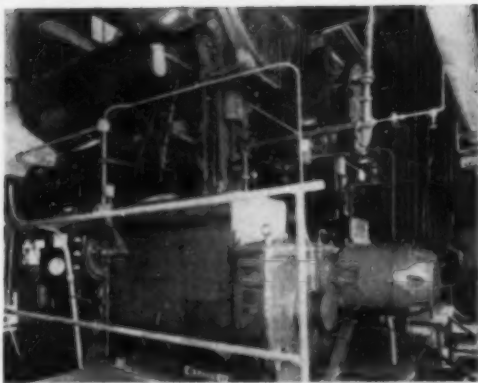
Credit should go to the Intercontinental Corp. for the courage and vision to undertake this project; to Seshasayee Brothers who organized the project for the Indian interests; to Charles Owen Brown and Singmaster & Breyer of New York and to Power-Gas Corp. of Stock-On-Tees, England, for collaborating on design, construction and operations.

The writer wishes to pay high tribute to all members of the original American and English supervisory staff named in the previous article. Also to the Indian division superintendents: V. N. Kasturirangan, chief engineer; P. K. Seshan, gas division; M. C. Verghese, ammonia division; S. Rajagopal, sulphate division; S. Nallaperumal, superphosphate division; N. D. Gopinath, chief chemist. Many thanks are given to V. Seshasayee, managing director, for his consent to publish this article.

# More Oil from Cottonseed

Anderson's Exsolex process has six big advantages:

1. More Oil
2. Better Oil
3. Better Meal
4. Fewer Fines
5. Smaller Losses
6. Lower Cost



PRE-EXPPELLERS put in ahead of solvent extraction plant achieved a sixfold improvement in cottonseed oil processing.

## N. HUNT MOORE

Using the new Exsolex process in its Wilson, Ark., plant, Delta Products Co. is getting more oil of better quality out of cottonseed. Solvent losses have been cut to less than half what they were with the former operation. What's more, processing costs have been reduced. A leader in oil mill technology, Delta is pioneering in the U.S. the use of this process, which the V. D. Anderson Co. of Cleveland, Ohio, developed.

An integral operation, the Exsolex process consists essentially of taking enough oil out of the cottonseed meats in a special high-capacity pre-exPELLER so that highly extractable flakes can be rolled from the pre-press cake, after which solvent extraction gets out the remaining oil in the prepared flakes.

But when V. D. Anderson engineers set out to develop their Exsolex process they had six tough problems to lick. They knew that to put the process on its competitive feet they would have to devise ways to:

- (1) Get more oil out of the meal;
- (2) improve the quality of the oil;
- (3) improve the quality of the meals;
- (4) eliminate fines in the solvent-oil mix-

N. HUNT MOORE, general superintendent at Delta's Wilson, Ark., plant, supervised erection of the solvent plant and installation of the Exsolex process there. He is responsible for the operation of the plant.

ture known as miscella; (5) decrease solvent losses; and (6) reduce over-all processing costs. That they succeeded is evident from the way Delta's plant is running today. Before we check its performance on these six points, though, let's first see just how it operates.

### THE PROCESS

At the mill, cottonseed is unloaded from trucks and boxcars and stored in large Muskogee seed houses. From these houses, the seed is run through sand and boll reels to get rid of foreign matter. Conveyed to the mill building, the seed goes into large work bins equipped with variable-speed feeders. Seed from the work bins gets a second pneumatic cleaning to remove sticks, bolls, stones and sand that the reels did not remove. This clean seed is conveyed to a row of first-cut linters, where the longer staple lint is removed. Remaining lint is cut from the seed in a battery of second-cut linters. This lint is cleaned and baled.

Delinted seed is run over a safety shaker to get out any loose lint, metal and stones before it enters the hullers. In the hullers, seed is cut up so hulls can be separated from meats by shakers with air nozzles. Hulls from the shakers are beaten to remove fine meats that may be clinging to them. Separated meats go over a purifier shaker, where enough hulls are re-

moved with air nozzles to control the protein in the finished meal. Resultant meats, with a small amount of hulls mixed with them, go through a set of five high rolls.

From a small surge bin, the rolled meats are fed at a uniform rate to a cooker. Meats are cooked in the stack cooker in a manner that enables the pre-exPELLERS and the solvent plant to produce top quality oil. Cooked meats are then conveyed to the pre-exPELLERS, where moisture is adjusted in the cookers above the expellers. Oil from these pre-exPELLERS flows to a screening tank. There most of the "foots" are removed continuously and returned with the feed to the pre-exPELLERS. Oil from the screening tank is pumped to an agitated tank and then through a plate-and-frame filter to remove any remaining suspended meal. Cake from these filters is also fed back into the stream of meats going to the pre-exPELLERS. Filtered oil is pumped to storage. A set of cracking rolls breaks up cake from the pre-exPELLERS into small pieces. These pieces are treated and conveyed to the flaking rolls. Flakes from the rolls are conveyed to the top of the extractor in the solvent plant.

The extractor consists of a series of plates with a central shaft and revolving paddles above each plate. Flakes, introduced into the top of the counter-current extractor, fall by gravity through solvent. The solvent is intro-

duced in the bottom of the extractor and flows up through the column, where it dissolves the oil from the flakes and flows over a weir inside the top of the extractor. This miscella, or solvent-oil mixture coming from the extractor, flows to a tank and is pumped through a filter to remove traces of fine meal particles.

Clarified miscella is then pumped through a preheater that brings it to the boiling point of the solvent. Heated miscella passes into the bottom of a high-velocity rising-film evaporator. This evaporator discharges into an expansion chamber, where solvent vapors pass overhead to the evaporator condenser, and the oil settles in the bottom. This oil, which contains some solvent, is then introduced into a preheater and is drawn into the vacuum stripping column.

In the bubble-cap stripping column steam is bubbled up through the descending oil to remove the last traces of solvent. Steam and solvent vapors pass overhead to a condenser, and the water and solvent are pumped to a solvent-water separator. The oil is then cooled and pumped to storage.

Meal at the bottom of the extraction column is elevated in a drag-chain conveyor to a point above the solvent level of the extractor and is discharged into the dryers. The meal dryers, a series of steam-jacketed ribbon conveyors, remove entrained solvent from the meal. Leaving these dryers through a plug seal, the meal is conveyed to the meal room, where it is ground and sacked. Solvent vapors from the dryers are washed free of meal and condensed in the dryer condenser. Solvent and water from this condenser flow to the solvent-water separator. Solvent from this separator and from the evaporator condenser is returned to storage for re-use.

So much for how the plant operates. Now let's see how the performance of the Delta plant is proving that the Exsolex process is fully competitive on the six crucial points.

#### THE PERFORMANCE

**More Oil**—Delta is getting 375 lb. of oil from a ton of cottonseed, using the Exsolex process. This is a yield increase of 18 lb. per ton over the previous direct solvent process. With the new process, meal coming from the solvent-removal dryers contains an average of only 0.3 percent residual oil, compared with an average for the season of 2.6 percent with direct solvent extraction.

**Better Oil**—Oil from the pre-exPELLERS and the solvent plant is of

exceptional quality. The crude oil has the refining characteristics of hydraulic press oil and possesses a very light color. This crude oil refines to a light color and has outstanding bleaching qualities. From this oil the refinery at the Delta Products Co.'s plant manufactures shortening and a high-grade oleomargarine. Composite oil from the expellers and the solvent plant, refined in Delta's laboratory by the regular procedure, gives about 2 percent lower refining losses than solvent-extracted oil with comparable free fatty acids.

**Better Meal**—Meal produced by the Exsolex process is of improved quality. Its color equals that of hydraulic meal. What's more, the meal is almost completely free of gossypol, a yellow, crystalline phenolic compound, which is the toxic principle of cottonseed. This may open up a bigger market for cottonseed meal in the feeding of pigs, baby chicks and calves.

**Fewer Fines**—As the fourth big advantage, the Exsolex process has eliminated fines in the miscella. In the previous solvent operation, the miscella from the extraction column was passed through a continuous horizontal centrifuge to remove the bulk of the fines from the miscella before the final filtration. The flakes produced from the treated pre-exPELLER cake, however, are durable and do not disintegrate into fines during the extraction process. This characteristic has eliminated the need for the continuous horizontal centrifuge. In addition, the filter cycle has been increased from a few hours to a few days. With these longer filter cycles, the solvent plant can operate with a minimum labor force. The longer cycles also contribute heavily to other great savings in solvent, filter aid, filter cloths and gaskets.

**Smaller Losses**—The Exsolex process cuts solvent losses by more than half the amount for the former solvent operation. How has this substantial saving in solvent been achieved? First, the elimination of the continuous horizontal centrifuge cut the air load through the vent system to a minimum. Second factor is the increase in the length of filter cycles. By pre-pressing, the length of filter cycles has been increased from 6 to 10 times. Every time a filter is evacuated, opened and cleaned, some solvent is lost. Third factor that has effected a solvent saving is the lighter load on the distillation and solvent-recovery capacity. This saving in solvent means a substantial financial gain and also a reduction of the hazards inherent in high solvent losses.

**Lower Cost**—Most striking cost reduction is the big saving in steam. With direct solvent extraction, at a rate of 200 tons of cottonseed a day, as much as 60 gpm. of solvent had to be pumped into the extractor. All this solvent had to be heated from an average 80 deg. F. to its boiling point and then vaporized. Solvent vapors had also to be condensed with water. With the Exsolex process and at the same mill rate, however, only 20 gpm. of solvent is pumped to the extractor. Hence steam and water consumption has been cut to about one-third what it was. The amount of sparge steam used in the stripping column has been cut to less than half that needed with straight extraction. Steam to the steam jet ejector on the dryer condenser is turned completely off most of the time since use of the centrifuge has been discontinued.

Under present costs of steam and electric power at the Wilson, Ark., location, this saving in steam more than offsets cost of the additional power needed for the pre-exPELLERS. Savings of 20 hp. in cooling-water pumps, 35 hp. in elimination of the centrifuge and 10 hp. in pumping solvent and miscella have been attained. At the present mill rate, with the two pre-exPELLERS operating, about 280 hp. has been added, from which can be subtracted the 65-hp. saving in the solvent plant.

No additional labor has been hired. Instead, the men formerly engaged in the solvent extraction operation have been reassigned in such a way that they can take care of all equipment. At the same time, capacity of the plant has been increased since the pre-exPELLERS have been installed.

The pre-exPELLERS have not been running long enough to get definite figures on the maintenance cost of these machines. But the pressure reached in the barrels of these pre-exPELLERS is relatively low, so it is unlikely that their maintenance will be a large item.

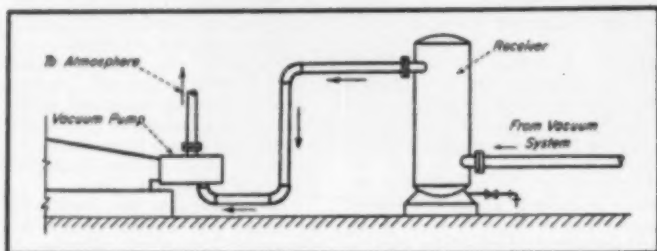
By installing the Anderson Exsolex process, with pre-exPELLERS ahead of its present 200 ton per day solvent extraction plant for cottonseed, Delta Products Co. has reduced its residual oil to 0.3 percent, cut its solvent losses to less than half, eliminated the need for a horizontal continuous centrifuge, cut its steam and water consumption to a third, and has produced a better quality oil and meal. While the new Exsolex process has been in operation only a short time at the Wilson, Ark., plant, it has demonstrated its advantages.



# How to Figure Reciprocating Vacuum Pumps

TYLER G. HICKS

NOTE: This article, considering calculations for what might be termed "low vacuum," rounds out *Chemical Engineering's* coverage of the vacuum field. In previous articles, Freneau discussed medium vacuum (*Chem. & Met.*, June 1946, p. 104-107) and Dryer has covered ultra high vacuum (*Chem. Eng.*, Nov. 1947, p. 127-131 and Dec. 1947, p. 122-124.)—EORTON.



**R**ECIPROCATING vacuum pumps find many applications in chemical plants. Used with filters, vacuum pans, gasoline recovery units, wood impregnating equipment, vacuum boxes, couch rolls, and presses, they produce the needed low pressure in drug, petrochemical, glass, paper, and mining plants—to mention a few. Calculations encountered in reciprocating vacuum pump systems are of three types: (1) time required to evacuate a receiver of given capacity, (2) power necessary to drive the pump, and (3) intake and discharge pipe sizes. By comparing vacuum pump operation to the more familiar air compressor, calculations can readily be understood.

As shown at the right, a vacuum system consists of a receiver to which are connected pipes from the vacuum outlets and pump intake. The pump takes air at low pressure from the receiver and discharges it at "high" pressure to the atmosphere. Although the substance handled is usually referred to as air, it may be a mixture of air and gases, according to the process served.

TYLER G. HICKS, of Summit, N. Y., is a specialist in general plant operation and design. He became interested in vacuum pumps when he found that average volumetric efficiency could not be used for "pump down" and other calculations—all of which led to this article.

Usual vacuum pump indicator cards resemble those in Fig. 1 (next page). At the left, with the receiver full of air at atmospheric pressure, the piston starts its suction stroke at 1 and reduces receiver pressure to 2. It continues to the end of the stroke 3, where compression begins. At 4 discharge of the air at slightly greater than atmospheric pressure starts, ending at 1. Cards at the center and right show the gradual reduction of receiver pressure to the normal operating pressure of the system. Of course, the number of strokes required to reach system operating pressure depends on receiver capacity, pump volumetric efficiency, and piston displacement. Study of these cards shows that a vacuum pump is actually a compressor which operates in the lower pressure ranges.

Although reciprocating air compressor and vacuum pump indicator cards are similar, performance characteris-

tics generalized in Fig. 2 are different. The two most important differences occur in the power and capacity curves. Thus, power input increases as suction pressure increases to a value somewhere in the range of 1 to 15 in. Hg. absolute. Beyond this range, required power input decreases. Hence, if a motor were chosen for the horsepower required at a suction pressure of 6 in. Hg. it would be overloaded before receiver pressure was 25 in. Hg. Vacuum pump capacity decreases with suction pressure until the so-called "dead-end" limit is reached. At this point, pump volumetric efficiency and output are zero.

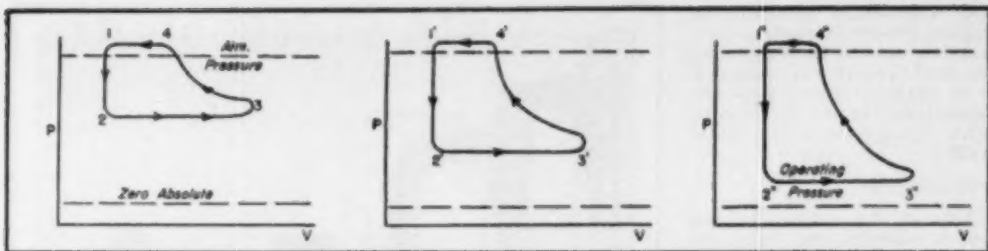
Besides variation in power input and capacity, vacuum pump volumetric efficiency decreases from nearly 100 percent at atmospheric pressure to zero at the dead-end limit. As a result, accurate analysis of vacuum pump operation requires use of calculus. For usual planning problems,

Evacuation Time Calculations

Abs. Press. in Receiver, In. Hg.	P <sub>r</sub> /P <sub>a</sub>	Cu. Ft. of Free Air In Rec'vr.	Removed	Aver. Vol. Eff., Fig. 1	Free Air Cap., Cfm.	Evacuation Time, Min.
29.9	1.000	200.0	0.0	0.00	—	—
25.0	0.849	179.8	20.2	0.91	54.6	0.370
22.8	0.768	159.6	30.2	0.81	48.6	0.415
20.8	0.688	139.6	40.0	0.73	43.2	0.464
17.8	0.597	119.4	50.2	0.62	37.2	0.544
14.8	0.499	99.2	60.2	0.53	31.2	0.645
11.8	0.396	79.2	70.0	0.43	25.8	0.776
8.8	0.295	59.0	80.2	0.33	19.8	1.020
5.8	0.195	39.0	90.0	0.23	13.8	1.450
2.8	0.094	18.8	100.0	0.14	8.4	2.094
2.0	0.064	16.8	100.0	0.08	6.4	2.280
2.0	0.064	16.8	2.0	0.07	4.2	0.476

Total time required = 9.019 min

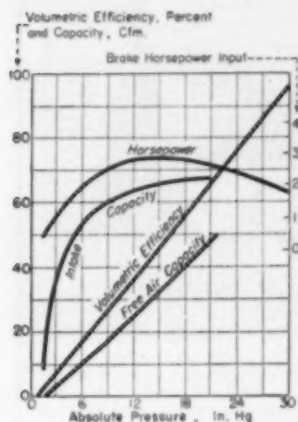




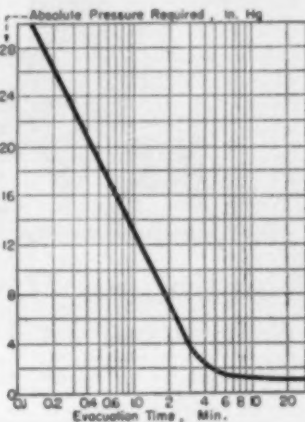
**1** Indicator cards for a typical vacuum pump show how the pump reduces

pressure in the receiver. At left is an early stage, at center an intermediate stage;

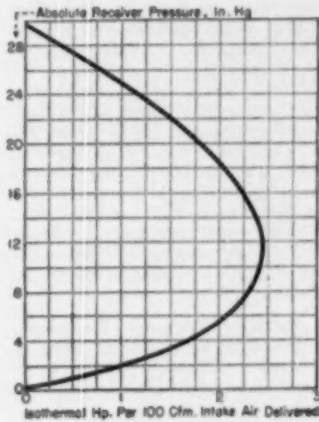
at right pump has pulled down to operating pressure.



**2** Characteristic curves for a typical reciprocating vacuum pump. Note the rising power curve, a factor to be considered in picking motor drive.



**3** Excavation time curve for a 100-cfm. pump and a 100-cu. ft. receiver, based on a pump with a dead-end limit of 29.5 in. Hg.



**4** Theoretical isothermal horsepower curve for vacuum pumps, for determining approximate power requirements after allowance for losses.

however, an approximate analysis will supply sufficiently accurate results. Such an analysis is made as follows.

**Example**—A vacuum system with a 200 cu. ft. receiver is to operate at 2.5 in. Hg abs. when the barometer is 29.8 in. Hg. Determine the time required to evacuate the receiver when a single-stage pump with a displacement of 60 cfm. is used. The pump is rated to dead-end at a 29.0 in. Hg vacuum when the barometer is 30.0 in. Hg, and pump volumetric efficiency follows the curve shown in Fig. 2.

**Solution**—The pump will have to operate to with 2.5 in. of the barometer, or a vacuum of  $29.8 - 2.5 = 27.3$  in. Hg. By selecting a number of absolute pressures between 29.8 and 2.5 in. Hg, and determining the amount of air removed from the receiver between successive pressure values, the time required for removal of this air can be found by use of the average volumetric efficiency (Fig. 2).

Thus, set up a table as on the pre-

ceding page. In the first column list pressure values between 29.8 and 2.5 in. Hg. Pressure reductions of 3 in. Hg have been assumed for all except the last few values where smaller reductions have been taken to improve accuracy. Enter in the second column the ratio of the absolute pressure in the receiver to the atmospheric pressure. Then, the amount of air remaining in the receiver, measured at atmospheric conditions, is the product of receiver volume and the ratio of pressures. This product is simply an application of the gas laws with receiver temperature assumed as constant. Assumption of constant air temperature is valid because, although air temperature varies during pumping down, the overall effect is fixed temperature.

The quantities of air removed from the receiver are next determined by successive subtractions of the values in the third column which are entered in the fourth column. Since the volumetric efficiency varies dur-

ing each pressure reduction, an average value must be used. The average volumetric efficiency can be found from Fig. 2 for this pump or from the characteristic curve of the actual pump to be used. Thus, the average volumetric efficiency during the pressure reduction from 29.8 in. Hg to 26.8 Hg is found from Fig. 2 to be 91 percent at  $(29.8 + 26.8)/2 = 28.3$  in. Hg. The value of 91 percent is entered in the fifth column.

The quantity of free air which the pump can handle during any reduction in pressure is numerically equal to the product of volumetric efficiency and piston displacement. For the above reduction it is  $0.91 \times 60 = 54.6$  cfm. However, study of the fourth column shows that only 20.2 cu. ft. is removed. Therefore, the time required is  $(\text{cu. ft. removed})/(\text{cylinder cap., cfm.}) = 20.2/54.6 = 0.370$  min.

By a series of similar calculations the total time required to evacuate the receiver is found to be about 9.0 min., as shown in the table. This

result is suitable for all usual design purposes because it closely approximates the actual time required and the errors involved are so slight as to be negligible since leakage into chemical plant vacuum systems often equals 100 percent of the volume handled.

#### APPROXIMATIONS

Although the method described here is satisfactory for design estimates, there are certain instances where only a first approximation of evacuation time is needed. Tabular calculations then require too much time. By using basic laws governing vacuum pump operation and Fig. 3, many common problems can be solved quickly.

For any vacuum pump, evacuation time is inversely proportional to piston displacement. Thus, when the evacuation time for a given displacement pump is known, either time or displacement can be determined for another pump. Fig. 3 is based on a vacuum system consisting of a pump with a displacement of 100 cfm. and a receiver with a volume of 100 cu. ft. Use is as follows:

**Example**—Determine the proper displacement for a vacuum pump to evacuate a 325-cu. ft. receiver to an absolute pressure of 10 in. Hg in 2 min.

**Solution**—Enter Fig. 3 at an absolute pressure of 10 in. Hg and project horizontally to read 1.35 minutes, the time required for a 100-cfm. pump to evacuate a 100-cu. ft. receiver. Since the receiver has a volume of 325 cu. ft. and 2 min. is available for evacuation, displacement =  $100(325/100)(1.35/2) = 220$  cfm.

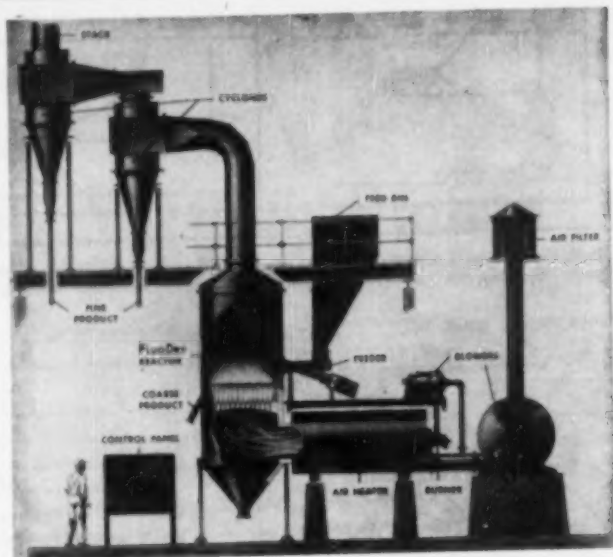
**Example**—Determine the time required for a 32.0-cfm. vacuum pump to produce an absolute pressure of 15 in. Hg in a 150-cu. ft. receiver.

**Solution**—From Fig. 3, time required by a 100-cfm. pump is 0.75 min. when receiver volume is 100 cu. ft. For a 32-cfm. pump and 150-cu. ft. receiver, time =  $0.75(150/100)(100/32) = 3.52$  min.

The curve in Fig. 3 is suitable for the ranges given but is not accurate where lower absolute pressures are necessary or where the pump departs markedly from assumed conditions. For such cases the tabular method of analysis should be used.

#### POWER REQUIREMENTS

Vacuum pump manufacturers usually specify the power rating necessary for a given pump. However, when



## Continuous Dryer-Classified

THIS NEW FLUID-BED UNIT has been developed by Dorr Co. for continuous drying and sizing of granular materials. The first unit of this Dorrco FluoDry system is operating at the Adams, Mass., plant of New England Lime Co. where it dries and sizes limestone before this is sent through the Dorrco FluoSolids system for calcination in a fluidized bed.

The new unit has three major parts: (1) a vertical cylindrical sizing compartment divided into two parts by a horizontal, perforated constriction plate; (2) a dust separation system of one or more cyclones, connecting with the top of the sizing compartment; (3) an air preheater attached to the wind-box of the sizing compartment.

Here is how it operates: (1) preheated air passes upward through the bed of coarse and fine limestone and

provides the heat necessary to evaporate the moisture in the feed; (2) the upward movement of gases carries off the fine limestone particles (whose settling rate in the gaseous medium is less than the upward space velocity of the gases). Drying is a function of heat supplied at the preheater; size separation in the 28-100 mesh range is a function of the space velocity of the gases.

The unit is expected to have general application in the continuous sizing and drying of granular or crystalline materials; it is likely that in many cases it will be used for sizing and drying simultaneously. It has already been fully demonstrated on limestone; it is believed to be equally applicable to dolomite, sands, iron ores, coal and similar materials. It may be used alone or with a FluoSolids system.

manufacturers' data are unavailable, an estimate of the power needed to drive the pump can be obtained from Fig. 4. It should be noted that this curve is based on air at intake conditions, whereas all other air quantities in this article have been based on free air at atmospheric conditions. Customary practice among manufacturers expresses isothermal horsepower as shown in Fig. 4.

#### PIPING

Suction and discharge pipe sizes can

be determined by using standard pressure loss equations, charts or tables. The most commonly used equation is that developed by Harris and altered by others to  $\Delta p = QF/P$  where  $\Delta p$  = pressure loss, psi./100 ft. of pipe;  $Q$  = flow rate, cfm. of free air;  $P$  = initial pressure at pipe entrance, psia.;  $F = 0.04185/d^{5.31}$ ; and  $d$  = pipe inside diameter, inches. Extreme care is necessary in sizing suction and discharge piping to prevent excessive friction losses which might overload the vacuum pump.

# Carbide Makes Allethrin\*

Background and highlights of the first commercial synthesis of an important new weapon against pests.

Bugs beware! A new weapon is being brought up. It is a clear brownish liquid. Its mild odor is unobjectionable to humans. Whether bugs find it objectionable or otherwise, many find it lethal. So, flies, mosquitoes and roaches—look out.

Pyrethrum—as bugs and entomologists know—is a natural product useful as an insecticide. The pyrethrum

flower grows in Africa. So there are two reasons why its varied and complex constituents have been studied so intensively: (1) it is effective, (2) it has to be imported.

About a year ago the Bureau of Entomology and Plant Quarantine (USDA) announced real results. They found that the allyl homolog of Cincin I was practically as good as

"pyrethrins." This homolog is synthetic and closely related to the bug-killing constituents of pyrethrum. The discovery attracted much attention.

For a number of years the Carbide and Carbon Division of Union Carbide and Carbon Corp. has been interested in pest control chemicals. So Carbide studied the synthesis. They liked the looks of the potential market. They knew of no emergency, but they did know that the natural product was classified as such a critical material that it was being stockpiled.

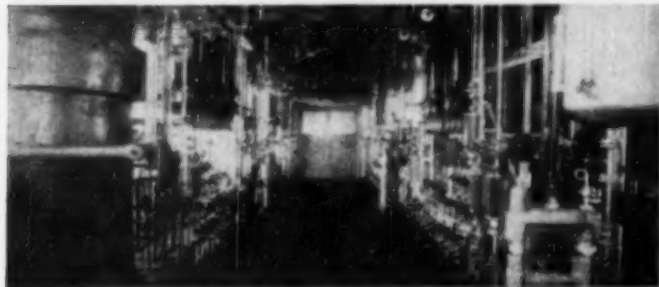
With respect to needed plant facilities, Carbide was uniquely equipped to produce the necessary intermediates. Many were regularly made in their South Charleston, W. Va., plant. Even though most of their small commercial-scale manufacturing facilities were scheduled for other use, they felt the allethrin job could be fitted in. They also knew from long organic chemical experience that they could turn out the requisite chemicals that they were not already making.

Two things made them hesitate, bulk and complexity. Twelve different steps were involved and 11 different intermediates had to be processed (see the flow diagram at the left). To produce a single pound of allethrin, almost 200 lb. of about 25 different chemicals had to be handled.

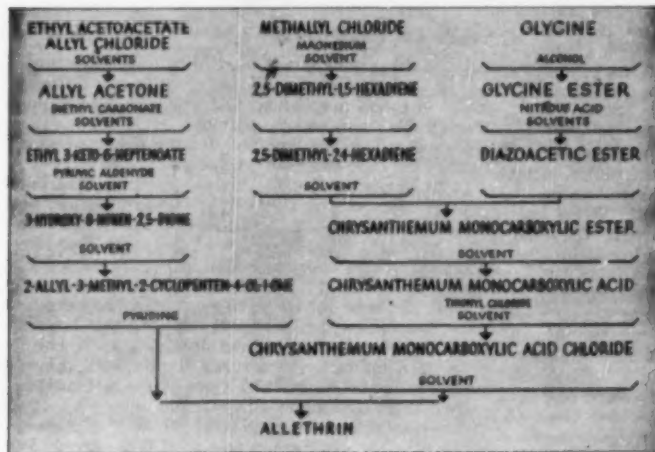
But they took a plunge. Laboratory and plant operating people forecast the complexities of translating operations from laboratory to plant scale. Their integrated effort brought the 12-step process to commercial fruition recently. They found that a million pounds of chemical solids and liquids, including water, had to be handled for each 5,000 lb. of allethrin produced.

Since the total market for pyrethrins is now in the neighborhood of 150,000 lb. per year, this would mean handling 30,000,000 lb. of material to satisfy the current market. Carbide engineers think this can be improved too. Eventually they hope to make many hundreds of thousands of pounds of allethrin per year.

The knowledge and experience gained in making the first commercial lot of the allyl homolog has greatly simplified and facilitated their future production of the material. Carbide is confident that the insecticide's uses can be expanded over the next few years.



PLANT where Carbide makes its allethrin. This particular still, left foreground, is used in one of the intermediate steps: processing ethyl 3-keto-6-heptenoate.



PROCESS by which Carbide arrives at allethrin. They have to handle nearly 200 lb. of about 25 different chemicals to get a single pound of the commercial product.



EFFECT of the new insecticide: (A) Cocky roach, (B) Weakly trips, (C) Dead bug.

\* *Al-leth-rin*, coined generic name for the insecticidal chemical *di-2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one* esterified with a mixture of *cis* and *trans* *di-chrysanthemum monocarboxylic acid*. —S. A. Rohrer, chairman, Interdepartmental Committee on Pest Control, Bureau of Entomology and Plant Quarantine.

# Where Management Falls Down In Collective Bargaining

A former labor negotiator points out management's little boners at the bargaining table—"little gremlins" that hinder settlement of big issues.

## FRANK PLASHA

Granted that collective bargaining is an accepted pattern of our industrial relations picture, that unions are a permanent part of the American scene, and that both organized labor and management decry the threat of compulsory arbitration—granted this and the desire for peace by both parties at the bargaining table—why does bargaining so often reach an impasse or fail completely?

For a number of years I participated in contract negotiations as a representative of organized labor. My bargaining experience was varied; one day I would meet a timber operator on a lonely hillside in West Virginia and he would place his "x" on a standard contract, the next day I would sit in the noisy back kitchen of a restaurant and work out wages and conditions for waitresses. My richest and most revealing experiences, however, came during collective bargaining sessions with chemical and allied corporations—Du Pont, Monsanto, Food Machinery, Linde Air, Ohio-Apex, National Lead, and King Powder.

Collective bargaining with this latter type of management—a group superior in the know-how of research, production, distribution, and staffed with the highest type of technical personnel—gave me some answers to the oft-asked question: What are some of management's shortcomings at the bargaining table?

It is agreed that labor, too, has many faults at the bargaining table. Labor, however, has its errors pointed out continually via the press, radio, and public opinion, or by stinging criticism and direct action of the membership.

Management, often perplexed, asks itself: "What happened? Why do our employees react this way? What did WE do that created a breakdown in collective bargaining? Why?"

Management is aware of and generally competent to meet the major issues with remarkable finesse, but management demonstrates regularly that it does not comprehend the existence of troublesome "Little Gremlins"—its faults in collective bargaining.

Today's collective bargaining process is a blend of many forces. Some of them are among the noblest ideas of man; others are among the most base. The clue to improv-

ing collective bargaining is not in abolishing either low or high ideals, but in improving the manners of conduct ("rules of the game") between labor and management.

Since collective bargaining basically involves people first, and the external forces that condition their behavior second, this study of management faults points up principally the "bad manners" of people as such.



## "Let's Get Confidential"

Of all the minor errors committed by management none can be so damaging as a fumbled effort to entice the key leader of union negotiations and influence his decisions through the "confidential" approach.

Consider these two incidents for the right and wrong strategy and their effect on negotiations:

(1) Corporation X and my union were deadlocked; both felt a solution was possible, but fear of certain labor and management personalities and their tendency to attack new ideas precluded a full discussion of problems. One afternoon, following a hopeless session, I made a remark that I was going to relax at a fishing point far from the city.

Near midnight the plant superintendent happened to pitch camp a few hundred yards from my tent (by accident?) and between fishing and discussion we tentatively drew up a satisfactory agreement. I discovered management's position on conflicting issues for the first time; he, in turn, discovered the union's positions.

A two-day delay in negotiations gave both of us an opportunity to sell our constituents on a possible agreement. We met; we negotiated; we agreed; and, frankly, the union members gained more than they anticipated.

This incident illustrates some important guideposts: (1) if you get "confidential" limit your confidence to one leader of the union, (2) meet far from the scene of tension for off-the-record talks, (3) do not plan the meeting; it just has to happen, (4) safeguard the reputation of the union leader by not placing him in a position of facing "sell-out" accusations. You will need his confidence again in the future.

FRANK PLASHA is well qualified to present the faults that labor sees on management's side of the bargaining table. He graduated from West Virginia Institute of Technology in 1941 with a B. S. degree in business administration and journalism. After a four-year hitch in the Army, he became a field representative in the chemical division of District 50 of the United Mine Workers in 1946. Last September he entered the School of Industrial and Labor Relations at Cornell to work for a masters degree.



(2) Corporation Y and my union were in an impossible situation. Both had agreed on many essential points, but when the vice president of the corporation entered the last stages of negotiations an impasse resulted due to his puzzling reluctance to participate in complete discussion on all contract details.

One morning, without any advance warning, the vice president suddenly exclaimed, "We're not getting anywhere this way. Frank, let's you and I step out on the porch a minute!" The committee was taken aback as much as I was at the obvious lack of confidence to deal openly with the rank-and-file, but they nodded assent and I "negotiated" on the porch alone with the management official while other members of both parties waited patiently inside.

The management representative took me into his confidence—would I sell the union the idea that this branch plant was not paying its way? He refused to explain the company's alleged precarious financial position before the full committee because, "They wouldn't believe me." He felt I could do the job. Yet when I stated I would cooperate provided I had certain financial facts and future plans, he refused to give me the complete story I needed to convince the membership of the necessity for maintaining a status quo wage rate.

That night, before hundreds of workers, the barbed question was put to me: "Just what did you discuss on the porch?" My answer? "The company can't pay more because (he says) it's on the rocks."

A strike followed which culminated in a 10 cent hourly increase after three weeks of idleness.

This incident points up several more guideposts to management: (1) when you are "in confidence" be completely confidential; don't play a cat-mouse game by withholding certain facts, (2) don't expect a union leader to solve a problem through his membership which is basically a management problem, i.e., financial, unless you elicit mutual cooperation through open discussion by all persons concerned, (3) never become confidential with the top union negotiator in the presence of his shop committee; the union members may become suspicious of their leader's loyalty and force him, in self defense, to push for extreme gains in order to regain his personal prestige and status.



#### Fashion Plate vs. Overalls

Unimportant as it may appear, the type of clothing worn by management representatives around the bargaining table can create a climate of subconscious hostility or cooperation. To illustrate: management of Z company would invariably appear at bargaining sessions in their most severe business dress—dark blue suits, white shirts, dark ties—termed by the union negotiating committee as being, "funeral dress," "window dummies" and "stuffed shirt" attire.

Workers do not give thought *per se* to a management negotiator who is financially able to afford expensive tail-

ored suits of top quality; the inner reaction is to the marked differences in dress between both groups which seems to accentuate the idea that, "We're Management—you're Labor—you sit there—we sit here—let's negotiate." Thus, class conflict is unknowingly cultivated by a seemingly minor phase of collective bargaining.

#### Two Words of Danger

Emphasis by management on lofty ideals instead of particulars of a contract exasperates union committees who generally believe management is window dressing negotiations and avoiding primary issues purposely.

Time and again two management words—"principles" and "prerogatives"—tend to raise storm signals. Discuss wages, hours, check-off, seniority with a union group and they will listen intently although management may have opposite views on the subjects. However, mention principles and prerogatives and the union representatives freeze; they immediately resent the high ideal sound of the words and their purport that the union is trying, "to run our business."

To convey the thought that management does have certain rights and privileges, it should couch its usual principles and prerogatives in terms used by organized labor which would then be palatable to the union. Terms such as, "the constitution," (charter); "by-laws," (Board of Director's decisions); "obligations," (commitments to employees, customers, stockholders); "autonomy" (right to manage the business) make up a language which has a familiar pleasant sound to union committees. To receive a favorable response talk the jargon of the union.

#### Setting the Stage

To have a controversial program accepted, management would do well to follow military strategy of softening up the opposition before proposing its master plan.

Management's usual attitude of viewing contract negotiations as a necessary once-a-year chore places it in the deluded position of ignoring the vital build-up, contacts, behind-the-scenes activity, and education needed prior to presenting a new idea to the union committee. Throwing out a cold proposal on the bargaining table will meet with a frigid union response.

The following incident is remarkable for one management's understanding of labor union and employee reactions; I consider it a model case study.

A branch of the National Lead Corporation—Evans Lead, Bownmont, W. Va.—was faced with problems of absenteeism and low productivity. As the union representative, I realized that it was not possible to gain as much in straight-across-the-board increases from Evans Lead as was to be gained from other plants in the vicinity.

How could labor and management cooperate to increase production, reduce absenteeism, and raise wages?

Many months prior to negotiations, the plant superintendent and I discussed the problem and finally formulated a tentative incentive plan. Both of us, by a slow process, began discussing the plan with several individuals and then gradually widened the circle of discussion.

At the negotiating sessions management presented its incentive plan in detail. Was it accepted completely? Not at all. More convincing was needed; one must realize the inherent fears and suspicions of union members to incentive plans.

The plant superintendent was invited to the union hall to explain the plan. And to allay various genuine doubts, I proposed that the plan be operated on a mutual trial run basis for six months—either party could cancel the plan, no binding formal signatures required, a cooperative ven-



ture. The idea was accepted and ratified by the union. Results: production increased, absenteeism was almost nil since the plan depended on group efforts, wages increased, union members felt the company was sincere and the rewards just. Today the plan remains in effect.

Management's fault of neglecting to take time out from immediate day-to-day duties to lay the groundwork for future negotiations is detrimental to its interest for improving relations with the union. Plan ahead! Begin convincing the other party early. Warm up the labor group to problems which involve departure from normal practice.



#### Invitations to Dinner

A social problem often facing both labor and management during lengthy negotiations is: shall we have lunch together or separately? A sincere invitation by management to the union representatives to dine at the company canteen or restaurant is often rejected, or if accepted, creates turmoil in the plant.

Management fails to recognize that the union negotiating committee is under constant observation by all plant workers during the tense period of contract talks. False accusations usually follow the breaking of bread, to wit, "You can't fight 'em one minute and eat with 'em the next."

A general policy for management to follow: if you feel that you can improve industrial relations, by all means plan to extend an invitation to the union group to have lunch with you. However, do not extend the invitation suddenly to the entire union committee. Confer first with the union spokesman in advance. His reaction will serve as a guide to management action, and if he feels a joint dinner is feasible he can convince the few recalcitrant members of his committee the desirability of accepting your invitation when it is finally presented formally to the entire group.

The "Little Gremlin" in this respect is usually a failure to appraise local plant sentiment and effects resulting from social cooperation between labor and management. Thus, when management attempts a well intended courtesy, and its invitation is refused without explanation, management may take the attitude that it cannot possibly promote good will under any accepted methods.

#### A Lost Victory

Did you ever hear of a management which granted concessions too easily and too early during negotiations? It happens. And with disastrous results not anticipated by a management which believes sincerely that its action is wise.

To the rank-and-file negotiating committee, the give and take at the bargaining table provides a genuine thrill. Fighting for a gain, matching techniques and strategy, and engaging in a difficult struggle makes the final victory a major accomplishment for the union. The committee

can declare with pride to its membership, "We fought 'em tooth and toe nail, but we won!" And the membership, in turn, receives vicarious joy.

However, the sad spectacle of a management granting demands to "get it over with" and not allowing the union an opportunity to fight and argue all supporting facts out of its system is, in effect, a lost victory for the labor negotiators. They cannot gloat over their victory. They cannot impress the membership with a job well done.

Result: because the union has been denied its opportunity to enjoy the thrill of verbal combat, it subconsciously creates imaginary grievances later to fill the void of needed self-expression.

Management, have you decided early in negotiations to accede to the union demands? Don't! Play the game of competition to the point where you feel the union has exhausted its ammunition—then concede. The fruits of victory will be sweet to the union.

Watch your timing!

#### Role of Informers—Results

A unionized plant, during the negotiating process, keeps a non-union plant nearby informed of bargaining progress. At the same time the negotiating union is conducting an organizing drive at the non-union plant.

What happens? Today the union agrees to a five cent hourly increase at the unionized plant, or additional holidays, or more premium pay. The next morning employees at the non-union plant read bulletin board notices that, "Your company has decided to give you a five cent hourly increase, etc."

The effect: the union negotiating committee becomes antagonistic toward the organized plant management with a feeling that it is thwarting the union's growth.

Such an incident occurred so regularly in a W. Va. industrial city to the extent that employees of the non-union plant would greet organizers distributing literature with, "Well, what are you going to get for us today at the Blank Co.?"

No announcement should be made or information divulged about the progress of bargaining until the entire contract has been agreed to and signed. Contrary action by management is a shortcoming which can only invite union distrust.

#### The Men Who Matter

Regardless of the influential role played by the union's chief spokesman, management must begin directing more attention during contract negotiations to Joe Worker—the rank-and-file employee from the shop. A major fault herein is that management usually directs its questions and comments to the trained union negotiator and ignores the shop employees comprising the full committee. True, some unions create such a case when their leaders agree beforehand that no one can speak until the chief union spokesman gives the signal.

"The desire to be important is the deepest urge in human nature," said John Dewey, America's outstanding philosopher. And the desire by the union committee to get "gripes off your chest" cannot be overlooked as a safety valve. Management must use all the subtle human approaches possible to make the union committee feel important, to find out their special interests and accomplishments, to encourage talking whether it is particularly relevant to the subject or not.

The professional union representatives have an occupational habit of moving from one territory to another. But the workers management negotiates with today will probably be around tomorrow. Therefore, concentrate on the

workers—your employees. Give all an opportunity to contribute their two cents—it may save you dollars later if you listen closely to their views.

One basic rule: never take advantage of an inexperienced worker on the negotiating committee by putting him out on a limb and then cutting it out from under him. This happened at one of the chemical plant negotiations in Charleston, W. Va. and the individual's dignity was so damaged that his vociferous opposition to contract ratification prevented acceptance by the membership. As a result, management paid three cents more per hour per employee before the agreement was accepted. A costly price, indeed, for an error in overlooking the fact that "I" is the most important word to every individual.



#### **"Check With the Home Office"**

One of the greatest frustrations to labor's desire for cooperation concerns itself with the limited authority given to resident plant managers by their home office superiors.

A typical situation: both local parties have negotiated amicably up to a certain point. Then, the plant manager announces, "I'll have to check with the home office." If a great deal of tension and anxiety is prevalent in the plant, a delayed answer from the home office creates additional tension.

The great error committed by management in such a situation is that the home office is removed from the scene; regardless of efficient communications, reports, et cetera, it cannot appraise the difficulties entirely. You just cannot negotiate by telephone. If the home office returns the resident manager to the bargaining table with a "No" answer, what happens? The union sympathizes with the manager ("it's not his fault"), and censures the home office.

In a crucial impasse, the home office usually dispatches an expert to the scene who dramatically arrives via plane to solve the problem. Expectations are high. The climax is near. The usual result? The "expert" is only human; he must review bargaining points developed prior to his appearance and also go over the already battered arguments. Inertia develops. Finally, out of sheer desperation and lack of any rationale, brought about by physical fatigue, the parties "agree." Is this collective bargaining?

Union negotiating committees urge management to: (1) give the plant manager complete authority to make decisions, or (2) if the organization of the corporation prohibits this, then have a home office representative sit in from beginning to the end of negotiations. Also, the last minute entrance of the expert is not as effective as management tends to believe since the local union group usually looks upon him as the crux of their troubles. ("He's the top dog; without him we would be able to settle this.")

#### **"You're Our Boys . . . But"**

Today's dilemma faced by certain management groups in attempting to plan sensible action between contending right and left-wing unions points up a crucial management fault: inability to remain impartial.

In planning for the future, management might consider that a certain group of employees would be more democratic and representative of the majority than another group. And management's judgment, in this respect, is usually correct. Therefore, management indirectly assists or gives its blessing for certain individuals to become elected as officers, grievance committeemen, or negotiating committeemen of the union.

Difficulties develop when the "blessed" union representatives enter negotiations for the first time. Their usual logic is thus: "We are forced to gain more than you granted that old radical outfit last year—if we don't, we'll be out and they will be back in to cause trouble."

What would you do if caught in such a crossfire of union rivalry? The sins of partiality have come home to roost on the bargaining table. Regardless of the action management takes at this moment, it will create additional problems.

#### **Can "No" Be Said Diplomatically?**

The extent of union demands generally forces management to say "No" more often than "Yes" during negotiations. And management's manner of saying "No" is one of its faults which develops friction. Can "No" be said diplomatically?

Consider how this word of repugnance (to union negotiators) appears in various forms of type: NO! No! No. no. No? It can also have different connotations when spoken.

Avoid use of "No" per se. Management often fails to sweeten the vinegar with sugar by such phrases as: "You have a lot of merit to your contentions, etc., however . . ." "Now if you had a business of your own, what would be your comment?" "We think you're right, but conditions out of our control prevent us from . . ." "Let's put this problem on the agenda for next year, then maybe . . ."

It is possible for management, when pressed for a decision, to toss the ball back to the union committee and have it give the "No" answer. For example: the personnel director of a New York department store warns new female employees in an orientation session, "Girls, in this store you do not chew gum!" Result: antagonism. The personnel man of another store asks politely, "Girls, do you think it is proper to chew gum while waiting on customers?" The answer? "No!" But who said it? The employees themselves!

The management faults outlined here are not all-conclusive. However, they are the ones usually slighted by management in its collective bargaining relationship with union groups.

It must be emphasized that the ideas expressed are the result of experiences with single plant negotiations. Management's faults under industry-wide or multiple-employer bargaining may certainly be different and of greater or less significance. Nevertheless, the "Little Gremlins" are on the scene wherever labor and management meet to resolve differences.

To those alarmists who consider collective bargaining as collective bludgeoning and a farcical ceremony leading both Labor and Management to Hell, I can only defend my belief in collective bargaining by pointing out that the highway to Heaven is well marked. It's the responsibility and duty of both Labor and Management to avoid the detours.

# High Quality—High Yield Carbon Black

Formerly held incompatible, high quality is combined with high yield at Sid Richardson Carbon Co.

JOHN T. COX, JR.

New techniques permit both high quality and high yield at the world's largest plant for the manufacture of channel-type carbon black. This plant is operated by the Sid Richardson Carbon Co. at Odessa, Tex. The government built it during the war to meet an unprecedented demand for use in tire manufacture.

## GAS SWEETENING

Sour well gas is converted to sweet gas via the Girbotol process at the field site. Burning of sweet gas results in lower grit content in the product, and reduces its acidity. Low grit content and low acidity are necessary for carbon black of rubber-compounding quality; low acidity also minimizes the corrosion problem in succeeding operations. As an added precaution against H<sub>2</sub>S contamination, gas from the Girbotol units is water-scrubbed before it is burned.

## BURNER HOUSE FEATURES

Unvarying flames are necessary for equilibrium cracking conditions. This calls for very close pressure control of

the gas to the burner-house distribution network. The system can handle from 40 to 80 cu. ft. of gas per day per tip.

Burner tips are precision-made to 0.001-in. tolerances. The shape of the burner tips and the slot width produce a long, lazy flame of the desired smoke characteristics. The plant has approx. 1.6 million of these tips in its 536 burner houses.

The burner-house channels, which move slowly back and forth over the flame bank in a 14-min. cycle, are 8 in. wide and about 140 ft. long. Fan-shaped flames play upon the channels from the tips, 3 in. below. A pivoted scraper removes the deposited black from the channels.

Draft conditions are highly critical. They are regulated so a blanket of smoke hangs in the top of the building, extending down to the flame tips. If the blanket is too high, the flames will burn brightly and will waver; if too low, they will be snuffed out.

## PROCESSING

Newly formed black is in a very fluffy form at this stage, having a density of about 1 lb. per cu. ft. Immediately on arrival at the processing house the fluffy black is sent through a Mikropulverizer to break up any lumps that may have been formed. The black is then elevated to the top

of a three-pass combiner (pelletizer) that is peculiar to the carbon black industry.

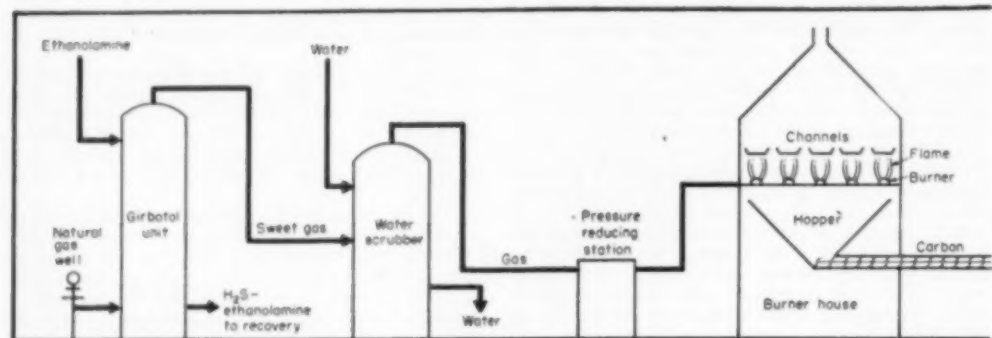
This combiner consists of three spiked shafts in compartments, one above the other. The carbon moves down by gravity, gradually taking up water without ever seeming wetter than a dry crumbly, putty-like mass. Addition of an equal weight of water during continuous agitation agglomerates the extremely fine carbon into fine pellets; and the bulk density is raised from 1 lb. per cu. ft. to over 22.

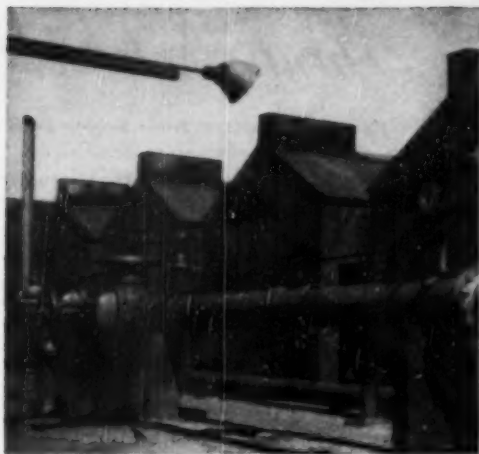
Once the pellets are formed, they are dropped into the end of a direct-fired stainless steel rotary furnace for drying. The transit time through this horizontal furnace is approximately 45 min. The black is then screened for pellet size classification, and is stored in huge silos for shipping.

Steel hopper cars are scrupulously cleaned before shipment to avoid any metallic or silicious contamination.

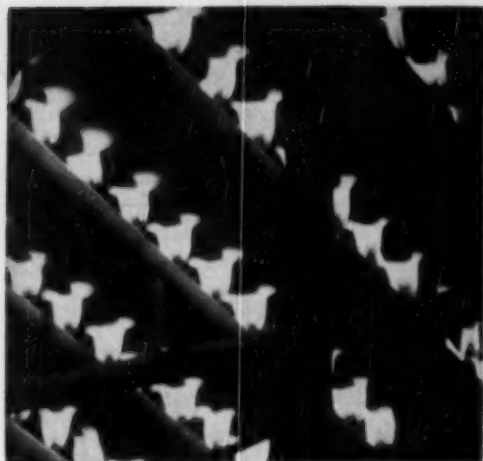
## YIELD

A modern channel carbon black plant can produce efficiently a precision product if certain exact practices are followed and if the correct raw material is to be had in quantity. For years we have been led to believe that the channel process was an incredibly wasteful manufacture, since the carbon yield from the standard thousand cubic





Pressure reducing station and a few of the burner houses.



Burner tips in operation. Flames play on the channels above.

feet of natural gas of 1,000 to 1,050 Btu. was in the vicinity of 1.00-1.20 lb., while carbon content of this gas is about 32 lb. under field conditions. But this comparison ignores important factors.

In the channel process a flame impinges on a metal surface and carbon is deposited. This sounds like a simple procedure, but closer examination reveals that it is a fairly complicated reaction. To obtain carbon from methane there must be an expenditure of energy and that energy must come from the gas itself.

The flame temperature necessary for the separation of carbon is about 2,600 deg. F. The gas entering the burner tip must be raised to this temperature; the glowing unburned carbon is also at or above this level. Using gas of 1,050 Btu. per M cu. ft., 40 percent of the hydrocarbon is used as fuel for this heating and cracking operation. This leaves only 60 percent available for black recovery,

or only about 19 lb. of carbon per M cu. ft.

At 1,420 deg. C. and a contact time of 0.010 sec., 24 percent yields theoretically should be obtained from pure methane cracking. This 24 percent of the available carbon (19.2 lb.) would be 4.6 lb. Hence, theoretically, the following is a proper yield table:

Lb. of Black per M cu. ft.	Percent of Theoretical
1.0	21.7
1.5	32.6
2.0	43.5
2.5	54.3
3.0	65.2
3.5	76.2

The modern carbon black plant strives for such higher yields; but quality is the first consideration.

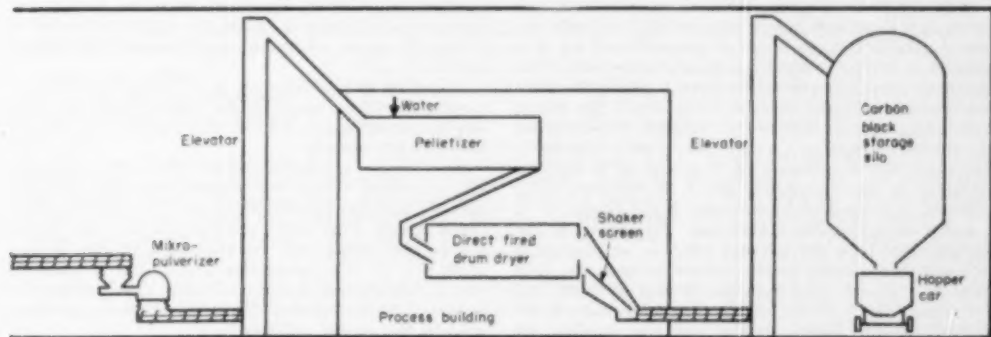
Channel carbon black is a "clean" product. Its handling and care in preparation put it at the consumer's platform at about 95.0 percent car-

bon. The remaining percentage represents regain moisture and volatiles, with only about 0.15 percent ash.

#### USES AND TESTS

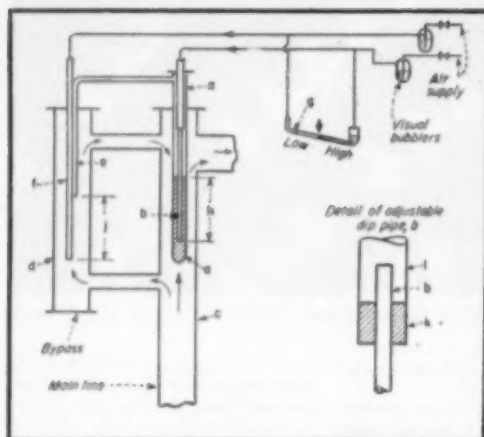
Although channel carbon has many uses, its principal outlet is in tires for transportation. Over 95 percent goes into rubber products for automobiles, buses, and trucks. The remaining percentage of varying grades goes into printing inks, paints and varnishes, and cosmetics, with a very small use in food manufacture.

Channel black is submitted to numerous physical and chemical tests, with corresponding purchase specifications. Some of these are: pellet size distribution, electrical resistivity, individual particle diameter (size range 130 to 300 Angstrom units), surface area (80-120 sq. m. per g.), ash, moisture, pH, heat buildup, flex cracking resistance, power consumption, tubing rate, and compounding physicals.



# The Plant Notebook

THEODORE R. OLIVE, Senior Associate Editor



## Continuous Density Indicator Is Compensated for Temperature

FREDERICK CARR, Engineer, Sarnia, Ont., Canada.

★ April Contest Prize Winner

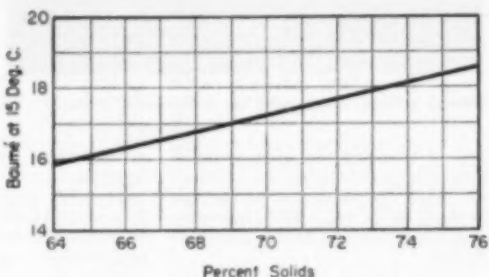
In using a circulating glycol-water mixture in a process, it was necessary to keep the composition of the mixture constant. The density indicator described was designed to give a continuous indication of the density of the flowing mixture, with complete compensation for variations in temperature.

In principle, the method employed is to use two bubble-type density indicators so connected that the pressure generated in one of them is opposed to that generated in the other. One of these is applied to the flowing stream, and the other is applied to a standard mixture of the desired composition. By immersing the standard in the flowing stream it is held at the same temperature, so that complete compensation for temperature changes in the flowing stream is achieved.

Referring to the diagram, the standard solution is contained in a closed-end tube *a*, provided with a single dip-pipe *b*, the length of which is adjustable. Tube *a* is inserted in a pipe *c* which carries the main flow. The restriction caused by *a* serves to divert a small part of the flow through a bypass chamber *d*, in which the second bubble-type density indicator is installed. This consists of a double dip-pipe unit, a short tube *e* and a long one *f*. The short pipe *e* is connected to *a*, and air is supplied separately to the dip-pipes *b* and *f* through two visual bubblers. A sloping-tube manometer *g* also connected to *b* and *f* completes the installation. Dimension *h*, the immersion of *b* in the standard solution, is adjusted to be equal to dimension *j*, the distance between the open ends of *e* and *f*. Consideration of the pressures and hydrostatic heads in the system will show that if the densities of the flowing stream and the standard are

equal, there will be zero differential across the manometer *g*; and any differential pressure appearing at *g* is directly proportional to the difference between the two densities.

The easiest method of making dimension *j* equal to dimension *h* is to fill the bypass chamber *d* with a mixture of the standard composition; and then to adjust dip-pipe *b* until there is zero differential at *g*. Dip-pipe *b* is made adjustable by a rubber bushing *k* in the pipe *l*, as shown in the detail.



## Quick Method for Estimating Solids In Viscous Liquors

MURRY L. OLIVER, Research Chemist, Hopewell, Va.

In operating evaporators it is necessary to know the percent solids of the discharge liquor. The usual method is to use the Baumé-solid relation at the temperature of operation. However, there are many cases where the discharge liquor is so viscous and fluffy that it is impossible to use a hydrometer, and it is necessary to determine the solids either by the oven method or the xylene method, both of which are time consuming.

For routine mill control, it is possible to estimate the solids in a viscous liquor within 5 min. by the following procedure:

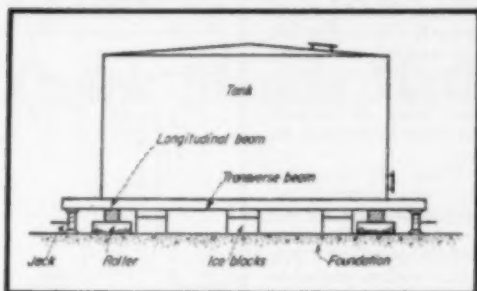
Dilute a definite weight of the viscous liquor with a definite weight of hot water and mix. Then take the Baumé reading (hydrometer marked in tenths), and the temperature. Convert by calculations the Baumé and temperature to Baumé at 15 deg. C. Apply the Baumé at 15 deg. C. to an established graph to give the percent solids.

The graph is established by determining the solids on samples of viscous liquor by the oven method and plotting the results against the corrected Baumé at 15 deg. C. of the diluted samples.

To illustrate one application of this method, consider this procedure: Weigh into a tared vessel 200 grams of viscous liquor and pour in 400 grams of hot water. Shake and mix well. Pour into a cylinder and take the Baumé reading and temperature, for example, 15.3 deg. Baumé at 60 deg. C. Correcting this Baumé and temperature gives a Baumé of 17.9 deg. at 15 deg. C. Applying the Baumé of 17.9 at 15 deg. C. to the sample graph above will give the percent solids as 72.9.



Of course, to use this method, a curve must be established for the case in point, plotting percent solids in the viscous liquor, against the corrected Baumé at 15 deg. C. in the diluted sample. Also, a suitable method must be used for correcting the temperature and Baumé to Baumé at 15 deg. C.



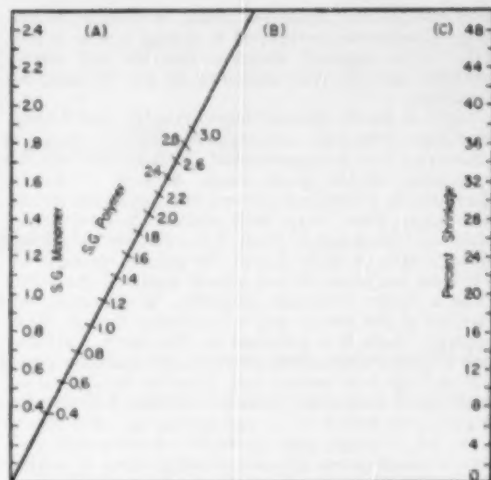
### Ice Blocks Used as Lowering Jacks In Installing Oil Tank

FRANK GIBADLO, President, Process Chemical Specialties, Beverly, Mass.

Several years ago a concern I was then associated with acquired a 50,000-gal. oil tank of vertical cylindrical shape. Coming in by barge, it was set on transverse and longitudinal beams and was transferred from the barge to the site by using rollers. A flat concrete base had already been prepared as the foundation for the tank. Our problem, then, was to remove the supporting beams and rollers from beneath the tank without having to use several large cranes.

The tank was first rolled directly over the position on the foundation that it was to occupy. Mechanical jacks were placed under the transverse supporting beams at four points and the tank was raised high enough to permit standard blocks of artificial ice to be placed at least four points under the tank proper. The number of stacks of ice blocks was calculated so that the rollers and longitudinal supporting beams could be removed, followed by the transverse beams and the jacks, when the latter had been screwed down.

The tank was now supported on the ice blocks. After a few days of gradual and uniform melting of the blocks, it came to rest quietly and easily on the foundation, just as desired.



### Nomograph Determines Volume Change From Specific Gravity Data

FRANK S. NICHOLS and RALPH G. FLOWERS, Transformer and Allied Products Laboratory, General Electric Co., Pittsfield, Mass.

Change in volume of a liquid or regular solid—which is not accompanied by a change of state—can readily be determined by direct measurement. In determining change of volume when there is a change of state, e.g., liquid to solid, or where the sample is an irregular solid, a far simpler procedure is to measure the specific gravity before and after the change. The shrinkage (or expansion) can then be calculated from the expression: Percent Shrinkage =  $100 (SG_1 - SG_2) / SG_2$ . This expression applies to any change in volume not accompanied by change in weight, whether or not there is a change of state. Specific examples of fields in which it is particularly useful are the shrinkage of monomers on polymerization, and the change in volume of substances when they melt or freeze.

When a considerable number of measurements are to be made, the calculation can be much simplified by constructing a nomograph of the type shown here. This is a nomograph used for calculating the shrinkage of a monomer on polymerization. In order to obtain reason-

★MAY PRIZE WINNER—A \$50 prize will be issued to . . .

MELVIN NORD  
Associate Professor of Chemical Engineering, Wayne University, Detroit, Mich.

. . . for an article showing how fluid flow rates can be measured by impact without Pitot tubes or other special devices, and without appreciable pressure loss. This article, winner of our May Contest, will appear in our July issue.

\$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical*

*Engineering* will award \$50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the June winner will be announced in July and his article published in August. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at usual space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other

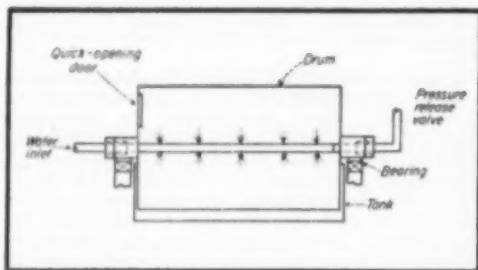
than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data, as well as new cost-cutting ideas are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

able accuracy, the nomograph should be restricted to the range required and constructed to as large a scale as possible. It is suggested, therefore, that the user should construct his own chart according to the following instructions.

Scales A and C represent respectively SG, and Percent Shrinkage. These scales are parallel and any convenient distance apart. Scale A is graduated in a linear manner over the appropriate specific gravity range. Scale C is likewise graduated in a linear manner over the appropriate shrinkage range. There is no fixed relationship between the scales used for A and C. Scale B is a straight line passing through zero on Scale A and 100 percent on Scale C. (If these two points do not actually appear on the chart, it is a matter of simple proportion to determine the position of the line so that it would pass through these points.) Scale B is graduated for SG, but is non-linear and is constructed as follows: A straight line from point 1.0 on Scale A to zero on Scale C passes through 1.0 on Scale B. A straight line from 2.0 on Scale A to zero on Scale C cuts Scale B at 2.0, and similarly for other values.

In use, a straight edge (preferably of transparent plastic) is placed across the corresponding values of specific gravity on Scales A and B and the shrinkage read off where the straight edge cuts Scale C. Obviously, the chart can be used in reverse to calculate either specific gravity, if the other specific gravity and the shrinkage are known.



### Drum Type Washer Speeds Up Washing of Precipitates

J. C. DAS GUPTA and S. MUKHERJEE, respectively, Superintendent and Chemical Engineer, Calcutta Chemical Co., Ltd., Calcutta, India.

Illustrated above is a simple and inexpensive piece of equipment developed for the washing of compressible precipitates and those which tend to adsorb or entrap impurities very strongly.

The machine is a drum of squirrel-cage construction, rotating on a hollow horizontal trunnion. The drum is covered with filter cloth and finally with a fine wire mesh. It is rotated within a tank. Water, entering through the trunnions, is sprayed over the drum contents through a series of fine holes in the central pipe.

Precipitate is charged through a quick-opening door. The drum then rotates in the tank, which is full of water, at 25 to 30 rpm. As the drum rotates the mass tosses and tumbles within it, being exposed thoroughly to the spray of clean wash water from the central pipe. If hot water is used, its vapor may develop enough pressure within the drum to make a pressure release device desirable, as shown on the diagram. When washing is complete, as indicated by the wash water, the door is opened and the mass removed.

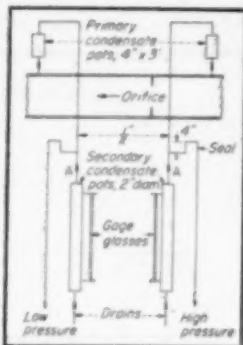
### How to Cut Maintenance on Orifice Meter for Wet Gas

G. L. SLOCUM, Instrument Supervisor, Sunray Oil Corp., Duncan, Okla.

In a conventional flow metering hook-up where only the primary condensate pots were used, service was required on the flow meter at least once a shift. This resulted in the instrument being off stream a considerable portion of the time.

When the secondary pots were installed, the maintenance was reduced to a minimum. The instrument is now checked only once a week on routine inspection since the secondary pots are large enough to hold a considerable amount of condensate. If a level of liquid is apparent in the gage glass, the secondary pot is blocked off by means of valve A and the pot drained without disturbing the operation of the instrument.

This installation has been in service for eight months at the Sunray-Duncan refinery, measuring gas from the fluid catalytic cracker fractionator receiver to the low stage suction of the compressors. At no time has any condensate appeared in the meter chamber.



### KEEPS COAL FLOWING

Shown above is a steam-heating arrangement which enabled the Stauffer Chemical Co., at Niagara Falls, N. Y., to keep coal flowing to its boiler furnaces during the last winter. It has been found, according to the Industrial Mineral Wool Institute, that the problem of preventing coal from hanging up in outside storage hoppers due to freezing can be solved by steam-heating and insulating only the outlet tip. Copper tubing is wound helically around the outlet tip, to carry steam at 340 deg. F. The tube bank is then insulated with 2 in. of mineral wool blanket carrying wire mesh netting on the inner face and expanded metal lath on the outer. The finish is  $\frac{1}{2}$  in. of mineral wool cement coated with  $\frac{1}{4}$  in. of fibrated asphaltic emulsion and painted with aluminum paint.

# Plates vs. Vapor Rates—By a Quick Simple Method

Less than an hour of computation gives steam and plate needs for multicomponent separations. Laborious plate-to-plate calculations are bypassed.

J. W. DONNELL and C. M. COOPER

In any distillation column design it is possible, within certain limits, to reduce the steam and reflux requirements by increasing the number of plates. In selecting the number of plates which gives most economical operation, it is obviously necessary to know the relationship between plates and vapor rates. General empirical correlations were developed some 10 years ago expressing this relationship in terms of minimum reflux and minimum number of plates.<sup>1,2</sup> In multicomponent systems, however, where such correlations have their greatest value, no simple accurate method for determining the minimum reflux was available until recently.<sup>3</sup> Furthermore, the correlations available have been somewhat limited by the fact that the optimum operating conditions often lay in a region where accuracy was questionable. This article presents a simple and relatively accurate procedure for determining plates versus vapor rates, a procedure which includes the recent method for minimum reflux and a new correlation which is more readily usable by the design engineer.

## MINIMUM PLATES AND MINIMUM STEAM REQUIREMENT

For any required separation all practicable conditions of operation lie between the limiting condition of minimum steam and reflux (infinite plates) and that of minimum plates (infinite steam and reflux). This tabulation summarizes some of the most convenient methods for determining the minimum number of theoretical plates and the minimum reflux ratio.

For simple binary systems where the relative volatility

System	Minimum Plates	Method
Binary ideal <sup>1</sup>	$N+1 = \frac{x_{D1}/x_{B1}}{x_{W1}/x_{B1}}$	
Binary non-ideal <sup>2</sup>		Counting on $x$ - $y$ diagram
Multicomponent Ideal <sup>3</sup>	$N+1 = \frac{x_{D1}/x_{D2}}{x_{W1}/x_{W2}}$	

J. W. DONNELL and C. M. COOPER are respectively a professor and an associate professor of chemical engineering at Michigan State College. Their previous industrial careers represent a total of more than 25 years spent with major chemical process companies.

System	Minimum Reflux	Method ( $q = 1$ )
Binary ideal <sup>1</sup>	$\left(\frac{L}{D}\right)_M = \frac{x_{D1}/x_{B1} - x_{W1}/x_{B1}}{\alpha - 1}$	
Binary non-ideal <sup>2</sup>		Slopes on $x$ - $y$ diagram
Multicomponent ideal <sup>3</sup>	$\left(\frac{L}{D}\right)_M + 1 = \sum \frac{x_{Dn}}{1 - \theta/\alpha_n}$ $0 = \sum \frac{x_{Fn}}{1 - \theta/\alpha_n}$	

is nearly constant, e.g. most two component hydrocarbon systems, the formulas of Fenske are conveniently applied. For binary non-ideal systems, including azeotropic and all other two component mixtures, the number of steps may be counted on a McCabe-Thiele diagram. This diagram may also be used to determine the minimum reflux ratio unless unusual heat effects are present. In the latter case the method of Ponchon<sup>4</sup> may be used.

For multicomponent systems the minimum number of plates may be determined by the convenient Fenske equation, as long as the relative volatility does not vary widely. Until recently no simple and accurate method was available for determining minimum reflux in such systems. However, the important contribution of Underwood<sup>5</sup> has given us a method which is both convenient and rigorous.

In the case of systems which are both multicomponent and non-ideal, such as the complex azeotrope-forming mixtures of oxygenated compounds from Fischer-Tropsch synthesis, no standard method is used. However in those cases where accurate equilibrium data are available, the designer can, with a little ingenuity, usually calculate both minimum plates and minimum steam requirement.

## ACTUAL PLATES VERSUS STEAM REQUIREMENT

The optimum conditions of operation from an economic viewpoint lie somewhere between the uneconomic extremes of infinite plates and infinite steam. In order to determine such an economic optimum, it is necessary to know the values of several feasible reflux ratios and the corresponding number of plates. In general the relationship between plates and reflux will depend on the system

and on the separation required. A rigorous approach requires that each value of theoretical plates and corresponding reflux be determined by the method of Sorel,<sup>6</sup> or by one of its many simplifications. For multicomponent systems this procedure becomes long and tedious, and, for this reason its application usually contains numerous short cuts and doubtful assumptions. In many cases, the omission of the economic balance entirely has led to very uneconomical operating conditions, which were chosen by arbitrary selection of the individual designer.

Gilliland<sup>7</sup> and Brown and Martin<sup>8</sup> have shown that the relation between plates and reflux in a variety of systems might be approximated by a single relationship expressed in terms of minimum reflux and minimum plates. Such a relationship may be very useful, particularly in multicomponent systems, where the rigorous approach is excessively long. It permits the approximate determination of economic optimum in many cases where economic balances would otherwise have probably been omitted.

The usefulness of this empirical relationship was limited until recently by the fact that minimum reflux ratio in multicomponent systems could not be determined accurately, and by the uncertainties in the selection of optimum feed plate location. The work of Underwood<sup>4</sup> has provided a method of determining minimum reflux accurately and quickly, with a resulting increase in the importance and value of the empirical relationships. It also enables us to evaluate these relationships critically with respect to their limitations and improvement.

#### EMPIRICAL CORRELATION

In Fig. 1,  $(N/N_M)$  is plotted as abscissas and  $\log(V/V_M - 1)$  is plotted as ordinates. The numbers shown on the vertical axis are corresponding values of  $V/V_M$ . Here  $V$  is the number of mols of vapor boiling up at the base of the column, and  $N$  is the number of theoretical plates required in the column itself when a reboiler and total condenser are used. The subscript  $M$  indicates minimum vapor and minimum number of plates respectively.

The heavy line on Fig. 1 represents most nearly the average of all systems investigated in the work. Over 100 different conditions of operation were investigated in addition to those covered by previous authors. The study included binary, multicomponent, ideal, and non-ideal systems. It included also a systematic investigation of the effect of feed composition, degree of separation, and relative volatility on the reliability of the correlation. Wherever possible calculations were made according to the analytical method of Underwood.<sup>4</sup> Graphical methods and plate-to-plate calculations were avoided because they are inherently less accurate and give no measure of fractional plates.

The dotted lines of Fig. 1 show the upper and lower limits within which nearly all the separations investigated fell. The exceptions are systems having very high and very low key component ratios in the feed. These will be discussed later.

Fig. 2 shows the curves for three of the systems investigated. They are as follows:

Curve	Components	$x_F$	$x_D$	$x_W$
A	isobutane	0.4	0.98	0.02
	n-butane	0.6	0.02	0.98
B	ethanol	0.0223	0.629	0.0002
	water	0.9776	0.172	0.9998
C	$\alpha = 8$	0.30	—	—
	$\alpha = 4$	0.05	—	—
	$\alpha = 2$	0.10	0.192	0.019
	$\alpha = 1$	0.20	0.043	0.339
	$\alpha = 0.5$	0.30	—	—
	$\alpha = 0.25$	0.05	—	—

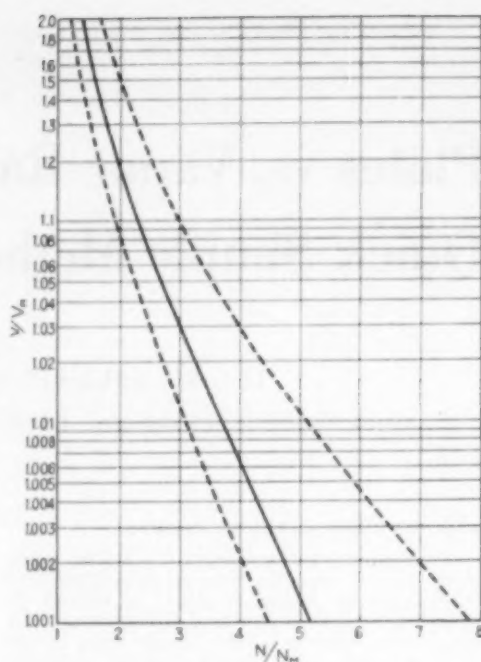


Fig. 1—Plates vs. Vapor Rates—the empirical correlation used.

Curve A is typical of a close boiling binary ideal system. Curve B shows a common example of a binary non-ideal system. Curve C is a hypothetical multicomponent system typical of hydrocarbon systems, in which the relative volatilities may be assumed constant at an average value. It will be seen that all three curves lie within the limits indicated on Fig. 1.

#### COMPARISON WITH PREVIOUS CORRELATIONS

The curve presented here is an improvement over the pioneering work of Brown and Martin and of Gilliland in several respects. One of the most important advantages is the fact that the curve approximates a straight diagonal line as the minimum reflux is approached. Since the optimum economic conditions generally lie in this region, it is of value to have a curve such as this, which can be easily read, extrapolated, or interpolated. The curve of Gilliland does not have this advantage. For vapor loads which are less than 10 percent above the minimum (and the optimum region is usually in this range), all points fall on an asymptotic curve within two horizontal divisions of the chart. A small error in reading the chart can result in a large error in the number of plates required. The curve of Brown and Martin is similarly an extrapolated asymptotic curve in these regions.

Fig. 3 shows data for the following two simple binary cases:

Case 1.  $x_F = 0.5$ ,  $x_D = 0.98$ ,  $x_W = 0.02$ ,  $\alpha = 1.25$   
 Case 2.  $x_F = 0.5$ ,  $x_D = 0.98$ ,  $x_W = 0.02$ ,  $\alpha = 5$

Curves are shown on the chart for these systems, calculated rigorously by Underwood's method, estimated from Gilliland's chart, estimated from Brown and Martin's chart, and estimated by this correlation.

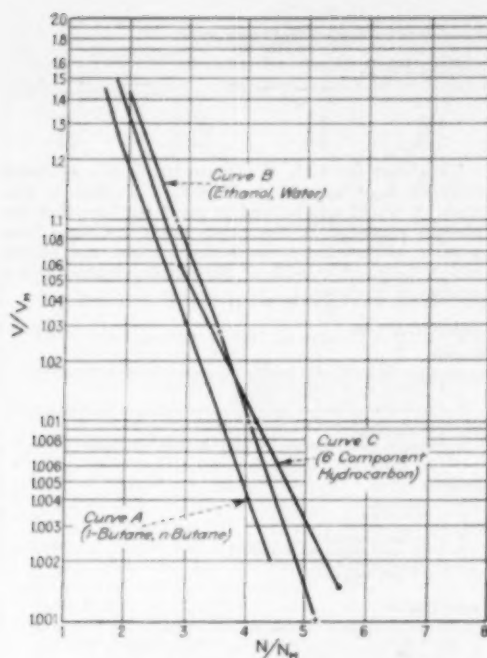


Fig. 2—Example curves for three different systems.

It will be noted that the curves of Gilliland and of Brown are much straighter and easier to read when using these coordinates than on their original plots. These replotted curves do, however, give a multiplicity of lines, the position of each depending on relative volatility and the separation to be made. Gilliland's replotted curve would however be a single and nearly straight line if the abscissa were changed from  $(N/N_R)$  to  $(N+2)/(N_R+2)$ .

It will be noted that the curves for Case 1 and Case 2 are closer to a single line on these coordinates than they are to Gilliland's values. This would indicate that the abscissa  $(N/N_R)$  is more suitable than  $(N+2)/(N_R+2)$ . Studies of a number of similar pairs of systems in which  $N_R$  was the only variable led to the same conclusion.

#### LIMITATIONS

Of the systems studied, the only ones which varied widely from the curve were those in which the ratio of the key components in the feed was over 5 or under 0.2. These systems in general give greater values of  $(N/N_R)$  than would be indicated on the curve. They do however follow the same trend as the recommended curve, and give a line on this sheet which is easily extrapolated or interpolated. Thus by plotting a minimum number of calculated points a good approximation of the entire system may be obtained. A similar procedure can, of course, also be used to make improved approximations for systems which lie within the limits set in this paper.

Other variables such as relative volatility of the key components and the degree of separation have some effect on the position of the curve, but these variations were all within the upper and lower limits shown in Fig. 1. This applies to relative volatility variations between 1.25 and 10, and to values of  $(x_{1D}/x_{2D})/(x_{1F}/x_{2F})$  between 20

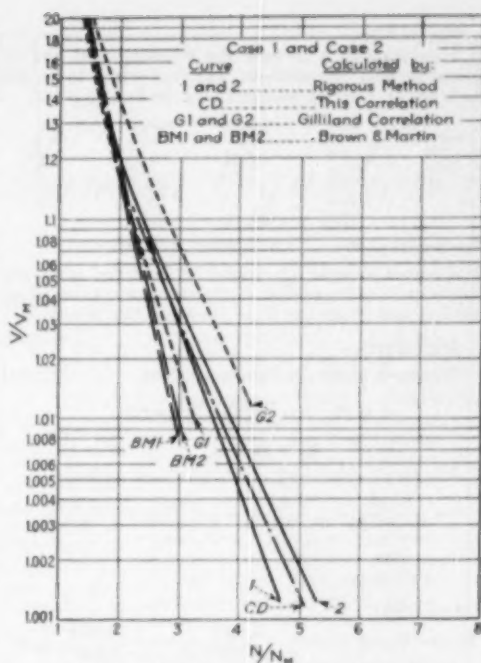


Fig. 3—New correlation lies right in the middle of the old.

and 250,000. In most of the systems studied the feed was assumed to be at its boiling point since this is substantially the case in most well-engineered installations. The effect of a vaporized feed or a highly subcooled one was not found to be great except where the relative volatility is high or the feed composition low in volatile components.

The number of plates determined by this method is, of course, the number of theoretical plates required, and must be corrected for plate efficiency in determining the actual plates required. Since the efficiencies used in design usually contain some factor of safety, no attempt has been made here to weight the correlation on the conservative side.

#### SUMMARY

Using the Fenske equation for minimum number of plates and the Underwood method for minimum reflux ratio, together with the correlation given here, it is possible within an hour to make a reasonable approximation to the relation between steam and plate requirements in a separation involving many components. Formerly, using plate-to-plate calculations, days and often weeks were required to do the same job. The results in those cases were on the whole less reliable than those obtained by the method suggested here. The length of the calculations made errors possible and even probable. This was particularly true in the region of the economic optimum where the actual reflux ratio was dangerously close to an uncertain minimum. In this region errors in selecting the ratio of key components on the feed plate might have led to calculated plate requirements several fold different from the number actually required.

An illustration of the method follows, using the Fenske equation for plates and Underwood method for vapor load.



# PROBLEM:

A debutanizer is to have the following feed and required product compositions. The feed rate is to be 100 moles per hr. entering substantially at its boiling point.

Component	Feed Mol %	Distillate Mol %	Residue Mol %	$\alpha$ avg
iso-C <sub>4</sub> H <sub>10</sub>	8.8	0.10	.....	2.38
n-C <sub>4</sub> H <sub>10</sub>	31.0	85.84	0.10	1.90
iso-C <sub>5</sub> H <sub>12</sub>	17.5	5.00	24.54	1.00
n-C <sub>5</sub> H <sub>12</sub>	17.6	.....	27.82	0.82
Ca <sup>+</sup>	30.6	.....	47.84	0.35
Total mole/hr	100	100.00	100.00	
		26.04	63.96	

It is desired to know the number of theoretical plates and vapor loads corresponding to steam consumptions which are 1, 5, and 10 percent above the theoretical minimum.

# SOLUTION:

Minimum plates, by Fenske equation,

$$(1.9)^{(N_M - 1)} = \frac{0.8584/0.0500}{0.0010/0.2454} = 4213$$

$$N_M = 12.0$$

Minimum vapor load, by Underwood method,

$$0 = \frac{0.033}{1 - \theta/2.35} + \frac{0.310}{1 - \theta/1.90} + \frac{0.175}{1 - \theta/1.0} + \frac{0.176}{1 - \theta/0.82} + \frac{0.206}{1 - \theta/0.35}$$

$$\theta = 1.2868$$

$$V_M/D = (L_M/D) + 1 = \frac{0.0916}{1 - 1.2868/2.35} + \frac{0.8584}{1 - 1.2868/1.90} + \frac{0.0500}{1 - 1.2868/1} = 2.688$$

$$V_M = (2.688)(36.04) = 96.88 \text{ moles per hr.}$$

From Fig. 1.

$V/V_M$	$N/N_M$	$V$	$N$
1.01	3.7	97.85	45
1.05	2.7	101.72	33
1.10	2.3	106.57	28

Thanks are due to R. W. Draper for his able assistance with the large number of calculations involved in this work. It would also be well to point out here that the method presented in this paper would not have been possible without the earlier work of Brown and Martin and of Gilliland or without the recent minimum reflux method of Underwood.

# NOMENCLATURE

## Symbols

- $V$  = Mole per hr. of vapor rising up from bottom of column.
- $L$  = Mole per hr. of liquid flowing down from top of column.
- $D$  = Mole per hr. of overhead product.
- $N$  = Number of theoretical plates in column itself when reboiler and total condenser are used.
- $x$  = Mole fraction.
- $\alpha$  = Relative volatility referred to less volatile key component.

## Subscripts

- $M$  = Minimum.
- $D$  = In distillate.
- $W$  = In bottoms.
- $F$  = In feed to column.
- 1 = For more volatile key component.
- 2 = For less volatile key component.
- $i$  = For each component.

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Plastics Show, Du Pont Booth: Bottle of Teflon suspension and asbestos gaskets impregnated with the suspension.

## Suspension Competition

The two commercial fluorine-containing plastics, Kel-F and Teflon, are running neck and neck. Both were displayed publicly for the first time at the fourth National



Plastics Show, M. W. Kellogg Booth: Bottle of Kel-F dispersion and valve body coated with the dispersion.

Plastics Exhibition held in March.

Alike in properties of high heat resistance and excellent chemical resistance, the two polymers have been aiming at similar applications. Both have been limited by high price and by the fact that it was practically impossible to make coatings of the polymers (their chemical resistance is so excellent that there are no solvents).

Du Pont was the first to lick the

coating problem when it announced Teflon suspensions last fall (*Chem. Eng.*, Nov. 1949). It did not take Kellogg long to catch up with a similar product—Kel-F dispersions.

In both cases, a colloidal suspension of the polymer is produced which can be sprayed or painted onto a surface and then baked to give a continuous film. The aim: corrosion-proof linings for pumps, valves, vessels and other equipment.

# The Human Equation

RICHARD L. DEMMERLE, Associate Editor

**To assure their own progress and industry's too, engineers must learn the practice of good human relations. But there is no handbook!**

The technical man's stake and needs in the field of human relations have now become a prime topic of formal symposia and not-so-formal bull sessions everywhere. At first it was only the psychologists and after-dinner speakers who worried about the slide rule practitioner in his relations with management and his fellow man. Now, however, judging by published articles and programs of various scientific societies, the technical man himself is beginning to indulge in some heavy introspection along these lines.

The recent annual meeting of the American Chemical Society heard R. B. Semple, president of Wyandotte Chemicals Corporation, offer the sound advice . . . "those who choose or are placed in operating positions rather than research must know more of human relations problems and how to meet them, or they cannot progress to the point where their technical abilities will yield the greatest dividends to them personally as well as to the companies they serve."

Another facet of this hard gem of industrial life was exposed at the same meeting by Francis Boyer, executive vice president of Smith, Kline & French Laboratories . . . "the scientist must bow himself in resignation to a fact—the fact that in whatever capacity he works, his ultimate bosses will be people who know a lot less science than he does."

Two more signs of the people-conscious times can be seen in the symposium on human relations that the New York Section of the American Institute of Chemical Engineers will present in early September and the symposium on the engineer in management that the

regional meeting of the institute will hear some six weeks later in Minneapolis.

As technical men well know symposia and formal papers on a subject have the dual purpose of reporting what has already been accomplished in a field while at the time drawing the bead on what must yet be done if progress is to continue. The chemical process industries are at present in the midst of such a stock-taking period on the use of their human assets. It is small wonder that the technically trained men at the core of enterprise are beginning to appraise themselves on their performance in the biggest unit operation of all: the management of people!

## Chemical Engineering =

unit processes +  
unit operations +  
human relations

Perhaps the best place to start and exploration of this subject is on the oft-asked question, "Are technically trained men different from other people?" The immediate but sometimes too quick answer is that they are—in the sense that their education and their life's work is concerned with techniques for handling things rather than people. This answer continues by saying that the technical person has an orderly concept of the world and everything in it. But when he tries to apply his methodical approach to the chaos of human emotions, he fails.

Psychologists go along in general with the above explanation and add

that technically trained personnel prefer to work by themselves or with their own kind. This desire, however, may be due largely to a community of interests, as revealed in the famous vocational interest studies conducted by E. K. Strong Jr. and his associates in psychology at Stanford University. This work consisted of determining the like-dislike (interest) patterns of members of 34 different professions and occupations. The individuals were questioned about their attitudes on 400 subjects that ranged from amusements and hobbies to reading matter and occupations. The 34 master patterns derived furnish a student, undecided upon the choice of a vocation, with a means to determine in what profession, taste-wise at least, he would feel most "at home."

But from the standpoint of human relations, the Strong Report has a second and even more important revelation.

In the summation of the work the interest scores of each of the professions is correlated with each of the remaining 33. And it is astounding to observe that over one-half of these correlations are negative in value. Statistically speaking this means that an antagonism rather than an agreement of interests exist among the professional groups that give industry life!

Management can take a well earned bow on its proved ability to resolve the conflicts among these sincere but divergently interested functionaries.

The Strong Report does not specifically list the chemical engineer. But there is good reason to believe that his interest score if taken, would land somewhere between those of the "chemist" and the "engineer" (a combination of mining, mechanical, civil and electrical engineers). On the Strong correlation scale 1.00 means complete agreement between any two profes-

(Continued on p. 216)

# Editorial Viewpoints

## A New Note in Tariff Talks

Apparently a brand new factor has entered into our basic tariff problem. It is the influence of certain labor groups who are concerned with exportable surpluses, in contrast with other labor groups whose employment might be curtailed through greater imports.

The new issue arises from a basic trade principle which can be expressed very simply, as follows: If we do not import many goods, we shall surely lose our export market for the things commonly sold abroad by American manufacturing enterprises. There are no dollars abroad to pay for our exports.

If this generalization were not true, we should have to assume either (1) indefinite give-away programs of our government, or (2) unbelievably large increase of the intangible factors of exchange settlement, or (3) many-fold increase in foreign travel by Americans, or (4) huge new investments by Americans in foreign enterprise on an altogether improbable scale.

Let us assume that we expect to continue to export a substantial percentage of the American manufacture of automobiles, office machines, household mechanical equipment and other products of the mechanical industries. How can these goods be paid for except by import of agricultural raw materials, metals and minerals, or chemicals and like goods made abroad. Obviously, the mechanical trades want to have a large export of their products. Equally certain is the desire of miners, farmers, and chemical workers to prevent or curtail the imports of goods produced abroad at extremely low wage rates as compared with American standards.

It is not yet clear how this competition of one labor group with another in the tariff controversy is going to work out. But we suspect that it may possibly prove a determining factor in influencing Congressional thinking on tariff questions. It may introduce a new political influence of major magnitude favoring free trade; or it may work just the opposite way.

## Another Benzene Crisis

Scarcity of benzene during the last few weeks has caused a real crisis in several essential divisions of chemical industry. Rubber is, of course, the major sufferer. But users of polystyrene and other plastics, as well as solvents and synthetics, are confronted with problems wholly new and tremendously serious.

The unrest in the rubber areas of the Far East has been serious in restricting the movement of natural

rubber. Speculators in rubber in the Orient have augmented this difficulty substantially. The inadequacy of the natural-rubber supply which resulted has created a greatly increased demand for synthetic rubber. Even with several government plants operating at capacity the full market requirements are not met.

Opening of other government plants which now stand idle has been prevented for some time by the inability to get enough benzene from which to make more styrene. The advance in the benzene price to 40 cents per gallon at the beginning of May was but a small indication of the seriousness of this problem.

Seldom has there been a better example of the interdependence of chemical enterprise than in this case. Involved are petroleum refining, coal carbonization, synthetic chemicals, synthetic rubber, plastics, and numerous other chemical units, not to mention the whole area of "coal-tar dyes."

It is essential that American enterprise seek out and bring to the United States more foreign benzene to meet the current needs, at least until greater synthetic production from petroleum can be stimulated in the United States.

## At Long Last

Finally after five frustrating years Congress has enacted and President Truman has signed S247—"An act creating the National Science Foundation." Differences of opinion on loyalty and security clearances as between the House and Senate versions were satisfactorily ironed out. So were the differences on public policy and administration that had led to a presidential veto of the earlier bill passed by the Eightieth Congress in 1947.

Now that the decks are cleared for action, we look forward hopefully to the appointment of the director and the 24 members of the National Science Board. These are positions calling for a new order of scientific statesmanship. May we respectfully renew the plea made on these pages in April that at least six of these men be selected from among eminent leaders in the major fields of engineering?

## Challenges of Refining

Petroleum refining is one of the most flexible and resourceful of the process industries. Its executives often have uncanny power to foresee both sudden and long-range developments and to adapt their thinking and plants to meet the changing needs. Because of this flexibility they have met the public's demand

for increasing quantity and higher quality of petroleum products. At the same time prices have been held to lower levels than for most other widely used commodities. Why?

Some of the reasons for this continuing achievement can be found in the wholesome philosophy expressed by Chester F. Smith of New Jersey Standard at the recent API meeting in Cleveland. After reciting and evaluating the many challenges which the refiner must face today, he comes up with this advice: "Clearly, leadership in matters of technology is fundamental. The refiner must also have a realistic view of what is ahead—the ability to make and use intelligent forecasts. He must be reconciled to occasional criticism from the public he serves. He must be prepared to do his part to clear up public confusion, such as that existing on the alleged need for synthetic fuels. He must be alert to changes in public requirements, like those brought about by the increasing availability of natural gas. He ought to recognize possibilities, like that of producing chemicals from petroleum, and he must be prepared to meet frequent small changes in requirements and have the flexibility to deal with them. This means not only the flexibility of refinery equipment—but, even more, the flexibility of the mind which is characteristic of free enterprise and is one of its major sources of strength."

### **New Insecticide Problems**

Evidence continues to accumulate regarding the possible seriousness to agriculture of insecticide residues in the soil. It is already demonstrated persuasively that the use of some insecticides creates serious difficulties on subsequent crops. Before long this may necessitate the abandonment of these chemicals for many present uses.

The two important materials which have been most studied thus far are DDT and BHC, (benzene hexachloride). It has been shown that these chemicals persist for years in the soil over which they have been used for insect control. For various types of fruits and vegetables there is some evidence that almost the entire quantity of chemical which is sprayed, goes into the soil and remains there for several years without being weathered away. Several important conclusions have been drawn by the official investigators which deserve thoughtful consideration immediately by all interested, both producers and users.

All insecticides must have considerable resistance to light and to rain in order to remain effective against insects for a reasonable time after spraying. This property of persistence permits these chemicals to remain for a considerable time in the soil also, either unchanged or in some stable product of initial breakdown.

Many of these residual chemicals, in fact most of the chlorinated compounds, have properties highly

detrimental to the growth of vegetation in the soil where they persist. Many of these even in moderate concentration prevent root growth and occasion large percentage loss of the fruit or other parts of the crop which have commercial value. In the case of BHC the crop (such as tomatoes and peanuts) may absorb products of highly objectionable odor and flavor. Only a moderate amount of BHC in the soil makes it impossible to grow certain varieties of tomatoes for the market. And at least one large purchaser of peanuts has found it necessary to limit his buying of goobers to those grown on land where exposure to BHC is not possible. The importance of this is evident when one thinks of peanut butter and salad oil, or canned tomatoes and ketchup with a "shoe-polish" flavor.

Any generalization that these insecticide "necessities" are doomed, would be unwarranted at this time. But there is no question that certain very important restrictions may need to be placed promptly on the use of these and other insecticides. Unless there is such restriction, it may be that we shall find that extremely valuable gardens and agricultural lands have been made unusable for normal purposes. The consequence would be of immense economic meaning. It is evident that chemical enterprise must pay more attention to the question of soil contamination.

### **Good News for Gardeners**

Chemical engineers make good gardeners. Within the month we have seen two beautiful lawns in Knoxville and Oak Ridge, Tenn. Both were carefully nurtured by the personal attention of outstanding leaders of our profession—Harry Curtis of TVA and Clark Center of Carbide. In each case we noticed with particular pride that newer products of chemical industry were removing some of the drudgery from the gardening process. We recalled how much fun and satisfaction we ourselves got a few years ago when we demonstrated the magic of 2,4D before our skeptical, dandelion-digging neighbors. But that will be only a curtain-raiser to what we will do this summer if what we have just read in Cyanamid's house organ soon becomes available in our suburban community.

What is this newest gift of chemistry to us amateur gardeners? It is the discovery that potassium cyanate is an effective and thoroughly practical killer of crabgrass. Imagine all the backaches it can save! Simply spray it on in the proper concentration and under proper weather conditions, and the old crabgrass dies without permanent injury to the desirable grass. In fact, when the potassium cyanate comes into contact with the soil, it obligingly breaks down into potash and nitrogenous fertilizing elements. The article says that no poisonous residues are left behind to injure man or animals. All this sounds almost too good to be true, but what is gardening except hope, hard work, and chemistry?

# Intermeshing of Chemical & Mining Industries

When two industries are as interdependent as the mining and chemical industries, it is not surprising that the techniques and methods of one are used by the other. Each has profited by looking over the fence into the other's back yard. Could you?

## Adoption of Flotation—Purification Of Rayon Spin Baths

A mining company technique has been successfully applied with only minor variations to the purification of rayon spin baths. The problem is to remove sulphur and  $H_2S$  which form in the acid baths.

Froth flotation does the job. Lead-lined flotation machines, commonly equipped with Fagergren units, fully-closed and vented to the outside, are used to continuously purify the bath. The agitation imparted to the bath helps remove the  $H_2S$ .

Before the introduction of flotation to the process, large settling areas were required, and  $H_2S$  fumes were a problem.

## Resin Production by a Metal Mining Company

Combined Metals Reduction Co., Stockton, Utah, employs such chemical plant operations as leaching, stripping, and solvent recovery in the production of refined fossil resin.

After flotation of a 60 percent resin concentrate from a coal and resin pulp, the resin is dried, leached with hexane, filtered, evaporated, melted, and cast for shipment.

The dryer hearths are heated by steam, both because excessive heat would melt the resin and because direct heat cannot safely be applied to so flammable a material.

Hexane was selected as the leaching agent because of its relatively low boiling point, its selectivity for the desirable resin fractions, and its ability to produce a readily filterable mass.

After pressure filtration, the cake is displaced by back-washing with fresh hexane. The hexane is recovered by adding live steam under thermostatic control to the mechanically-agitated mass.

The filtrate is clarified, then continuously evaporated to drive off approximately 65 percent of the hexane. The remaining hexane is flashed off as the thick liquor from the evaporator flows into a melting tank heated by immersion-type electric elements. The molten resin discharges continuously into steel drums for shipment.

Hexane from the cake washing unit, from the evaporators, and from the melter is condensed in three separate water-cooled condensing systems.

## Chemical Plant-Type, Centralized Automatic Control for a Mining Company

International Mineral and Chemical Co.'s Noralyn phosphate plant in Florida looks more like a chemical plant than a mill in some respects.

An unusual amount of automatic control is employed, with numerous automatic and remote indicating instruments centralized in a control room. Plant feed and various pump speeds are controlled automatically, as are classifier and hydroseparator underflow and overflow densities at many points. Flotation and spiral feeds are weighed and recorded remotely by weightometers on the feed belts. Flow of all reagents is measured by rotameters and recorded remotely, while critical temperatures are also controlled.

An interesting feature is control of the hydraulic lift on the hydro-separator rakes, which is provided to take care of overloading. To allow for contingencies, however, all automatic controls are provided with manual bypasses. Evidence of the efficacy of the controls is found in the fact that only about 20 men per shift are required to operate the entire plant, exclusive of the mine, and that much of the operation can be carried on from the central control room of the plant.

## Pyrolusite Leaching—A New Technique For the Chemical Industry

Work on leaching of Arizona pyrolusite, done during the war when foreign supplies of manganese ore were cut off, resulted in extremely rapid leaching of the ore to get manganese in solution.

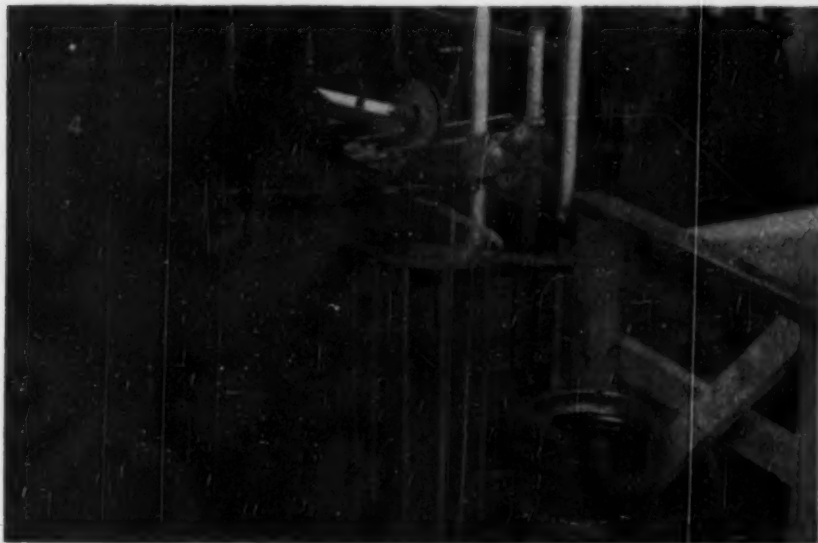
$SO_2$  instead of air was blown into a standard flotation machine containing a pulp of ore and water. Dispersion of  $SO_2$  by the impeller of the machine helped cut leaching time from hours by conventional means to minutes. Elsewhere in the process, this same technique, using air instead  $SO_2$ , was used to produce  $H_2SO_4$  in the pulp by oxidation of  $H_2SO_3$ .

This technique is not being used now because foreign supplies of manganese ore are again available, but the idea is at hand for cutting down the time consumed in chemical plant leaching operations.

## Some Chemical Companies In the Mining Business

Company	Location	Products	Via
Du Pont	Starke, Fla.	Ilmenite, rutile, zircon	Spirals, flotation
Carbide (U. S. Vanadium)	Bishop, Calif.	Molybdenum, tungsten, copper	Flotation
Carbide (U. S. Vanadium)	Rifle, Uravan, Colo.	Vanadium	Roasting, leaching
Allied (Solut-Solvay)	Longview, W. Va.	Coal	Cones
American Cyanamid	Piney River, Va.	Ilmenite	Spirals, flotation
American Cyanamid	Brewster, Fla.	Phosphates	Flotation
American Cyanamid	Berber, Br. Guiana	Bauxite	Crushing, washing
National Lead	Fredericktown, Mo.	Lead, copper, nickel, cobalt	Flotation
National Lead	Malvern, Ark.	Barite	Flotation
National Lead	Tahawus, N. Y.	Ilmenite	Magnetic, tabling, flotation
Engle-Picher	Cardin, Ohio	Lead, zinc	Heavy-media, flotation





# CARBIDE & ACETYLENE

Two out of every three cubic feet of acetylene generated now are used as a chemical raw material. New syntheses using the reactive gas may raise this ratio. But how will future acetylene be made? By the calcium carbide plus water method or by one or more of the electric arc or cracking processes?

## CHEMICAL ENGINEERING REPORT—JUNE 1950

For almost half a century acetylene has led an industrial double life. The highly reactive nature that has made it the familiar fuel of cutting and welding torches has also lent it to service as a starting material for numerous organic syntheses. In a sense, the combination of the simplicity and reactivity of the acetylene molecule makes it probably the nearest the chemist will ever get to a "universal organic building block."

**Acetylene  
discovery**

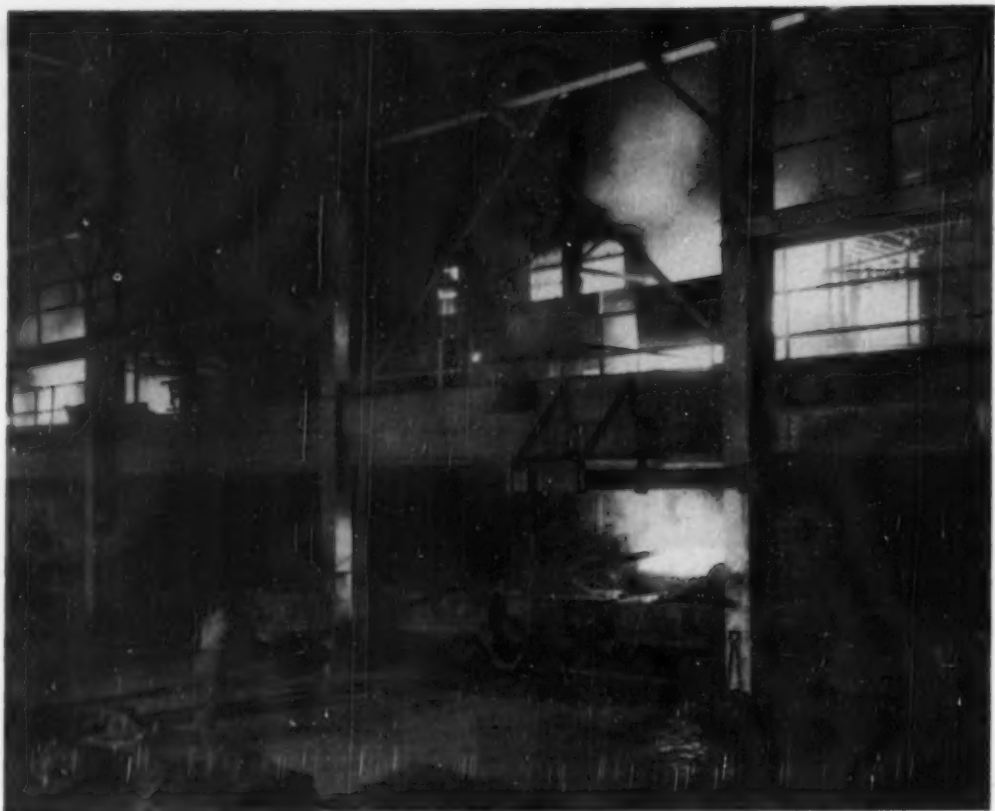
Man-made acetylene first saw the light of day in the laboratory of the English chemist, Edmund Davy, in 1836. Some 24 years later the French chemist, Berthelot, synthesized it by causing an electric arc to pass between two carbon poles in an atmosphere of hydrogen. He forced the mixture of gases resulting to pass through ammoniacal copper sulphate solution from which acetylene separated as a precipitate of copper acetylide. An examination of this material showed that its formula was  $C_2H_2$ .

The next big event in the story of acetylene took place in 1892 in a laboratory in Spray, N. C., where a group of technologists were

working under T. L. Willson on a process to produce elemental calcium from lime for use in the reduction of aluminum oxide. Their electric furnace yielded a product that although reactive with water was definitely not calcium. The puzzled experimenters sent a sample of the material to North Carolina State University for analysis. The report came back that it was calcium carbide and the gas it generated when in contact with water was acetylene. From that day on, the destiny of acetylene has been closely linked with that of calcium carbide.

**Carbide  
by  
accident**

The first commercial carbide plant in this country went into operation at Niagara Falls, N. Y., in April 1896, under the direction of J. M. Morehead, the son of one of the members of the team that made calcium carbide "by mistake." This company, the Acetylene, Light, Heat and Power Co., two years later became the Union Carbide Co. At first they devoted their energies and money to the development of acetylene as a means of increasing the heating and lighting values of water gas. After



In the heat of the electric furnace the calcium of lime and the carbon of coke are linked to make calcium carbide. The product gathers in a molten pool below the electrodes from where it is drained into chill cars to harden.

several disappointments along this line of endeavor, special burners, heating mantels and generating units were finally developed for using pure acetylene for cooking and the lighting of homes, farms and factories.

**Cylinders used** The Prest-O-Lite Co. at Indianapolis, Ind., began in 1906 to compress acetylene to 250 psi. at 70 deg. F. and pump it into cylinders packed with porous material saturated with acetone. This practice naturally evolved into the widespread use of the gas as a fuel for welding and cutting torches and a calcium carbide-acetylene industry took form.

There was interest in the use of acetylene as a chemical raw material as far back as 1910 when Germany began to use it as a starting material for many commercial syntheses. Four years later an acetylene based chemical industry was established on this continent by the Canadian Electro Products Co. at Shawinigan Falls, Que. This company, which later became Shawinigan Chemicals Ltd., installed commercial processes for the manufacture of acetaldehyde, acetic acid and acetone and supplied the Allied cause in World War I with sizable quantities of these materials.

The famous work of Father Julius A. Nieuwland, of the Catholic University of America and later of Notre Dame University, did much to further an interest in acetylene chemistry in this country. In 1914 the Union Carbide Co. established a synthetic organic fellowship at Mellon Institute. By 1924 the Carbide and Carbon Chemicals Corp. had begun to operate the first semi-commercial chemicals plant based on acetylene in this country at Niagara Falls, N. Y. Other companies followed suit and by the early thirties America had a sizable chemical acetylene industry under way.

This industry, however, was based on processes that used acetylene under low or moderate pressures. Commercial high pressure syntheses, though promising and interesting, were avoided because of the dangers and difficulties attendant in handling acetylene under conditions of high temperature and pressure. In addition no real need existed to resort to high pressure type syntheses since this country was endowed with good supplies of other organic raw materials such as coal, petroleum and natural gas.

German developments in high pressure acetylene work during recent years were forced by the

**Chemical  
spode  
work**

dire chemical necessity that country faced in World War II. Under the guidance of the famous chemist, Reppe, the Germans worked out and installed dangerous but well controlled commercial syntheses for the use of acetylene in the preparation of pharmaceuticals, plastics, textiles, detergents and solvents.

High  
pressure  
synthesis

The end of the war brought hundreds of allied investigators and scientists to Reppe's laboratory to find out how he had realized this dream of acetylene chemists. As these men returned to their native countries they brought with them a renewed hope that maybe, after all, it was possible to handle high pressure acetylene reactions safely and commercially. The new roads of organic synthesis that could be opened would be enormous in number. But the fact remained that acetylene as a chemical raw material would have to compete in many cases with coal, petroleum and natural gas. The first question then that these technologists have to answer is "what would be the most feasible process for the manufacture of chemical raw material acetylene itself?"

The following two sections of this report describe and evaluate some of the processes for manufacturing acetylene that may supply the answer.

## The Carbide Industry

R. J. NIEBANCK, Technical Assistant to the President, National Carbide Co., a Division of Air Reduction Co., Inc.

Calcium carbide, a laboratory curiosity before 1890, is now established as one of the basic raw materials of the chemical process industries. As the convenient compound for the generation of acetylene it is used in the manufacture of modern synthetic chemicals and end-products such as trichloroethylene, rayon, plastics and synthetic rubber.



There is little doubt that it will become increasingly important to the chemical and metallurgical industrial picture as the potentials of calcium carbide and its available acetylene become recognized and utilized.

Carbide  
grows up

Growth of the calcium carbide industry has been coincident with that of American industry in general. As the use of acetylene as an illuminant gas became supplanted by electrical services, acetylene from carbide enjoyed even greater employment as a high purity, high Btu. fuel for the welding, cutting and heat treating of metals. To this use for acetylene was gradually added that of a chemical raw material until a peak U. S. production of calcium carbide was reached during World War II of over 800,000 tons annually. Currently about 70 percent of all calcium carbide produced in this country is used to generate acetylene for synthetic chemical processes.

As the markets and production facilities for

calcium carbide have expanded, the requirements of carbide manufacturers for raw materials, processing equipment, labor and improved production and distribution efficiencies have also grown. This has been reflected in increased demands for high grade limestone as a source of calcium oxide; coke as a source of fixed carbon, and hydro and steam power, as sources of electrical energy for the furnaces in which the carbide is produced. Simultaneously the carbide industry has introduced into its processes new and higher production-distribution efficiencies by continued improvements in processing procedures and equipment and in methods of distribution.

Bigger  
furnaces

The production process of calcium carbide has experienced some rather outstanding changes. There has been considerable trend, for instance, toward the use of electric furnaces of increased capacity. Prior to World War I capacities rarely exceeded 5,000 kw. The capacity range today is between 5,000 and 18,000 kw. and there is every indication that the furnaces of the future will range in capacity upward to 30,000 kw.

Another significant trend productionwise is toward improved heat and materials process balances. This has been made possible by the development of prepared raw materials of optimum characteristics, the utilization of waste heat, the recycling of byproduct lime hydrate from acetylene generation and the recovery of waste dusts.

In the field of distribution two outstanding changes have occurred. There has been a displacement of the 100-lb. drum as the most common carbide shipping container. Now containers up to 5 tons nominal capacity serve not only as shipping and surge storage containers but as acetylene feed hoppers as well. They are designed to couple directly to the feed intake of the generator.

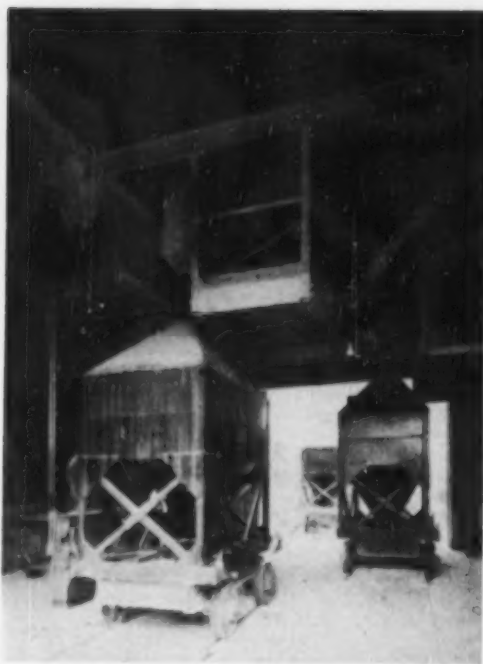
The second big development in the distribution setup for carbide is the trend toward the construction of on-the-spot carbide production and acetylene generating plants to supply neighboring chemical industries with pipeline acetylene. This, of course, works toward an elimination of carbide shipments. It also relieves the large processor, receiving pipeline acetylene, of the need to generate his own raw material.

Carbide  
by rail

Because of the geographical dispersion of the plants using acetylene, however, rail-shipped calcium carbide will probably continue for some time to be the principle manner in which chemical users will receive their acetylene. This practice involves no difficulty because calcium carbide is a dry solid amenable to relatively inexpensive and nonhazardous storage. The only qualification is that it must be kept absolutely dry.

It is a convenient source of acetylene since one ton of the carbide, upon treatment with water, will yield approximately 9,000 cu. ft. of acetylene of better than 99 percent purity.

The seeming "dead shipping weight" of the calcium content of a commercial grade calcium carbide can be rather well offset by the value of the calcium hydroxide formed during the



Five ton capacity containers are used to ship, store and feed carbide to acetylene generators. Twelve fit on a gondola car.

acetylene generation process. This latter material is variously referred to in the industry as carbide sludge, lime sludge, lime hydrate, and many other designations. Many of the uses listed for it in a recent report of the International Acetylene Association are in the field of agriculture. Here it may be employed to neutralize soil acidity, replenish the supply of calcium, promote the activity of beneficial bacteria and depress injurious soil organisms, improve the texture of the soil, hasten the decay of organic matter and the formation of nitrates and finally to act as a germicide in killing certain soil borne plant disease organisms.

Other industrial uses for the byproduct calcium hydroxide and listed in the IAA report are in pulp and paper manufacture, in metallurgy and in the leather, paint and petroleum industries. Also mentioned as outlets for the material are the building and construction fields and the neutralization of acid and sewage wastes.

Carbide  
as a  
reagent

In addition to its role as a precursor to acetylene calcium carbide is attractive chemically for its value as a powerful reducing agent. The loose chemical bond between its calcium and carbon atoms leaves both of these elements in a highly active state after the dissociation of the carbide molecule. Carbide reactivity with nitrogen is well known. It can be used to form calcium cyanamide which in turn is an important starting material for organic synthesis. Carbide is used in metallurgy and as an effi-

cient drying agent and moisture determinant.

When raw materials for its manufacture are considered it can readily be seen that calcium carbide reaches back to the fundamental resources of the earth. The demands for the calcium oxide and coke used in its manufacture are high in quantity and exacting in nature. For each ton of calcium carbide produced there are required approximately 2,000 lb. of lime, 1,300 lb. of coke and 3,000 kwh. of electrical energy.

#### Calcium Carbide Production

Year	Carbide, Tons	Materials and Power Consumption		
		Lime, Tons	Coke, Tons	Power, 1,000 Kwh.
1920	120,000	120,000	54,500	290,000
1925	150,000	150,000	97,500	450,000
1940	270,000	270,000	175,000	810,000
1945	675,000	675,000	432,750	2,025,000
1949	665,000	665,000	392,250	1,815,000

The electrical power for the calcium carbide process is taken either directly from the bus of an adjacent generating station or from a high line substation at a favorable supply line voltage. The resulting continuous power load of carbide producing facility is inherently one of attractively high load and power factors each of the order of from 85 to 100 percent. The greatest economy in operations occurs when the power supplied is without interruption and of steady unvarying voltage. Calcium carbide manufacturers are continually alert to the procurement and development of optimum calcium oxide, fixed carbon and power sources, because the quality and delivered costs of these three items normally represent the preponderant proportion of manufacturing costs. Any serious variance from optimum quality of these items not only affects production costs but also the quality of the end product.

In the carbide manufacturing process the coke and lime are received as raw materials for the electric furnacing operation after having been processed to assure a proper degree of calcination, dryness and physical size. These raw materials are then mixed or batched to charge ratio proportions of order of 2,000 lb. of lime to 1,300 lb. of coke. The mixed materials are fed by automatic means to the hearth of the electric furnace where they gravitate through the hearth adjacent to suspended electrodes below which a pool of calcium carbide forms. This accumulation may be tapped either intermittently or continuously through a tap hole in the side of the furnace.

Suspended single phase carbon electrodes in an "in-line", delta, or modified delta arrangement conduct the power into the hearth where the three phase circuit is completed partly through the resistive coke-lime charge and partly through the conductive molten carbide pool. The product calcium carbide is formed, in the high temperatures created by resistance, by the reduction of the lime by the carbon of the coke. The carbon electrodes are consumed and contribute to the formation of the calcium carbide.

Electrodes  
are a raw  
material

The ideal calcium carbide manufacturing location is one in which suitable limestone, coal,

power and markets are all found in the same immediate area. The largest single influence on plant location is that of power since it represents the biggest item of production cost. It is not amenable to efficient transmission at the low voltages desired and is usually needed in quantity blocks of such size as to warrant locating as close to a power generation station as possible.

**Plant location**

Sources of limestone, lime coal and coke exert relatively equal influence on plant location. But the more remote the operation is from the basic natural resources the more importantly do transportation costs affect the cost of product manufacture. Existing calcium carbide facilities are located strategically to serve industry economically as to all end uses of product.

For the future large additional usage of calcium carbide and acetylene the ideal plant location will be one in which the carbide manufacture, acetylene generation and acetylene end use or market are contiguous on immediately adjacent sites. Also it must be where coal, limestone and power are available to the carbide manufacturer at optimum quality and cost and where the end user of carbide and acetylene may find good conditions for the disposal of end products.

## Acetylene Generation

**M. H. BIGELOW**, Technical Director, Plaskon Division, Libbey-Owens-Ford Glass Co.

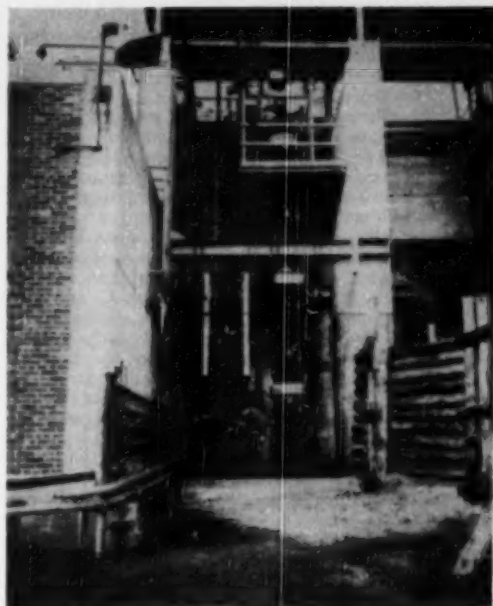
There are several known processes for generating acetylene. These are the carbide processes (wet and dry), the German arc process (Hüls), the Schoch discharge process (University of Texas), the partial combustion process (Sachsse) and the processes involving cracking in regenerative furnaces under atmospheric or low pressures.

Over 370,294 short tons of calcium carbide were produced in the United States in 1941. By 1948 this figure had grown to 682,934 tons. Of this amount it is estimated that 60 to 70 percent was used in the chemical field. As of December 1945 there were 13 calcium carbide plants in the United States and acetylene was generated in some 156 plants.

**Power makes carbide**

The Niagara Falls area with its cheap hydroelectric power is the natural prime area for carbide production. Ashtabula, Ohio, however, is gaining very rapidly in carbide production due to its proximity to coal and other natural advantages. A few years ago the Electro Metallurgical Div. of the Union Carbide & Carbon Corp. took over from the government a plant containing nine electric arc furnaces, operating at 75,000 kw. Three of these furnaces are devoted exclusively to the production of carbide. In the same area the National Carbide Co. has a five furnace carbide plant with a power load of 30,000 kw.

Except for some minor changes the process



General Aniline and Film Corp. uses concrete and wood barricades to form a bay around a high pressure acetylene reactor.

for the production of carbide has remained essentially the same. The generation of acetylene, though, has undergone some significant changes. The wet process, in which carbide is dropped at a measured rate into water, is being superseded by several different dry processes. These involve the addition at a proper rate of water to carbide and have the advantages of easier sludge removal and the disposal of the calcium hydroxide formed. Much has been accomplished in the mechanics of dry processing and little remains that can be done to lower its cost except what can be accomplished by lowering the cost of the carbide.

In the Hüls process natural gas (primarily methane) or coal hydrogenation byproduct gases, after purification to remove sulphur, are compressed to 1.4 atm. absolute and passed through an electric arc. While this process is referred to as an arc process, actually it is a partial thermal decomposition, as the arc becomes a source of heat (approximately 3,000 deg. C. at core), whereas a later process, invented by Dr. Schoch, of the University of Texas, is more truly an arc process.

**Hüls process**

The electrical requirements of the Hüls arc for natural gas feed are approximately 10 kwh. per kilogram of impure acetylene, which is increased to 14 kwh. for pure acetylene. These requirements are greater than those for the carbide process, but since hydrogen and carbon are also obtained, these are credited to the process. This makes the cost factor favorable.

In the operation of the Hüls process, hydrocarbon gases are passed through a bank of arcs each operating at 7,000 v. d.c. The typical



installation has 10 reactor sets, each set consisting of one mercury arc rectifier, for converting alternating current to direct current, and two arc-reaction tubes. One tube is used as a standby unit.

The arc will operate with methane (natural gas) or methane-ethane mixtures (byproduct from coal hydrogenation) as feed. The feed to the arc consists of approximately one part by volume of fresh gas and one part recycle gas. Each arc unit handles 2,000 cu. m. of feed which is expanded to 4,200 cu. m. per hr. during reaction. Operation of the arc is at 1.5 atm. pressure absolute. The terminal temperature in the reaction tube is 1,600 deg. C. and the reaction gases are immediately quenched to 150 deg. C. by a water spray. The primary electrode is jacketed cooled with 8 cu. m. of water per hr. and the reaction tube with 9 cu. m. per hr. Conversion per pass through the arc is approximately 50 percent. For 100 kg. of fresh gas therefore, 45 kg. of acetylene, 9.2 kg. of ethylene, 5.3 kg. of carbon black and 143 cu. m. of hydrogen are obtained.

After quenching the exit gas from the reaction tube it is sent to two cyclones in series in which 60 to 70 percent of the total carbon black is knocked down. The gas is sprayed with water in a wash tower to knock down most of the remaining black, and then passes through bag filters to remove the residual black. The bag filters are heated to prevent condensation and most of the water carried in the gas is next

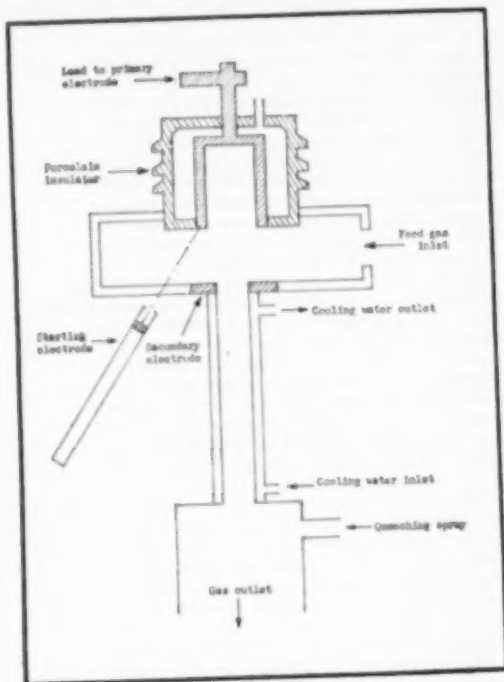
removed by spray cooling with water at 20-25 deg. C. which brings the temperature of the gas below the dew point.

Higher boiling constituents in the gas are removed by countercurrent washing with an aliphatic oil in a series of towers. The enriched oil is stripped under 600 mm. vacuum and recirculated. The gas from the oil washers is washed with water to remove HCN, and then passed through iron oxide to remove sulphur. After this preliminary purification, the gas is compressed to 19 atm. and absorbed in water in perforated plate towers.

The stripped gases consisting primarily of methane, ethane, ethylene and hydrogen are passed to the Linde plant where ethylene and hydrogen are separated out and the paraffins are returned to the arc. Acetylene is stripped from the water by four-stage flashing to a final pressure of 0.5 atm. absolute. As the gas from the first stage is too low in acetylene (45 percent), it is recompressed and recycled through the absorber. The gas from the 2nd, 3rd, and 4th flashers is brought together as crude acetylene of 90 percent purity, and is further purified. Water from the last flasher is blown with residue gas from the Linde plant to remove last traces of hydrocarbon gases, which can then be returned as feed to the arc, and the water is sent to the cooling tower. The crude acetylene is brought up to 97 percent concentration, with 1 percent CO<sub>2</sub> and 2 percent inerts as impurities, by a system of low temperature condensation and evaporation using liquid ammonia, and subsequent scrubbing with a petroleum distillate. This system removes acetylene homologs (methyl acetylene, vinyl acetylene, diacetylene, etc.). Carbon dioxide is removed by scrubbing the acetylene with caustic solution giving a final purity of 97-98 percent. This acetylene can then be used directly for the manufacture of acetaldehyde and ethylene.

A low temperature fractionation system is used to prepare recycle gas and to remove ethylene, hydrogen, carbon monoxide, nitrogen and oxygen. Air is compressed to 130 atm. and separated into oxygen and nitrogen. The liquid nitrogen at a pressure of 200 atm. is used as the coolant for fractional distillation of the gases not absorbed by water in the absorber system. These gases are methane, ethane, hydrogen, ethylene and byproduct coke-oven gases. The methane and ethane are separated by a single fractionation. The hydrogen and carbon monoxide are removed as the next fraction. The crude ethylene (15-25 percent) is removed and purified to 95 percent at a pressure of 30 atm.

There are a number of patents relating to combustion processes for producing acetylene from methane and other hydrocarbons. Some of these patents cover processes in actual commercial use. Of unique interest in this regard is the Sachsse process. It was in operation in Germany and had the war not interrupted progress, it appears that this process would have found considerable expansion, to the detriment of the carbide process. This process, in direct contrast to either the arc or carbide process, is endothermic. In its operation 800 cu. m. per hr.



A view of an arc-reaction tube used in the Hüls Process.

of methane and 400 to 500 cu. m. per hr. of oxygen are preheated separately to 500 deg. C., mixed and passed through a burner of very special design. The velocity of the gases is in excess of the rate of combustion. The temperature in the burning zone reaches 1,400 deg. C. but the secret of operation is to lower the burning temperature to 80 deg. C. within a period of 0.01 to 0.001 sec., by the use of a water spray. About 1,500 cu. m. per hr. of exit gas is obtained having the following composition: 8.9 percent  $C_2H_2$ , 3-4  $CO_2$ , 24-26  $CO$ , 54-56  $H_2$ , 4-6  $CH_4$  and 0-0.4  $O_2$ .

British  
liked it

The process is extremely interesting from a cost angle. British investigators were so impressed with its possibilities that it is believed that they have interested one of England's large chemical companies to build a unit. The process can be successful only if certain critical precautions are taken. The burner design must be correct, the gas velocity to the burner must be greater than the rate of combustion and the gas must be quenched within a very small critical range.

All of these factors require careful control equipment, which the Germans succeeded in working out. They utilized a dual system of cheeks based upon infrared absorption systems and colorimetric systems. Costs of acetylene, made by the process have been quoted at fantastically low prices, but until a more thorough study is made on equipment set up in this country these cost data are subject to verification. The probable costs will be comparable to those of the Schoch process.

Wulff  
cracking  
process

Acetylene can be made by cracking gaseous and liquid hydrocarbons in a regenerative furnace, according to a process invented by Robert G. Wulff. The Wulff invention is best described as a process of producing acetylene and ethylene by high temperature low pressure vapor phase cracking. The ratio of acetylene to ethylene produced is related to the temperature of cracking. At 1,000 deg. C. little acetylene is generated while at 1,200 deg. C. the amount produced is equal to the ethylene formed. Raw material feeds may be any hydrocarbon with two or more carbon atoms in the molecule, the choice of materials being dependent upon the availability and cost.

As with the Sachsse process, the gases are in the cracking area for only a fraction of a second. This is followed by immediate quenching to a temperature at which acetylene is stable. The furnaces are relatively simple thin metal shells filled with refractory bricks so placed that narrow channels exist through which the gases may pass. The cycle has been stated to be 4½ min. For 3 min. fuel gas is burned in the furnace to heat the bricks, then the fuel gas is shut off and the gas to be cracked, mixed with an inert gas is blown through the channels. Furnaces may be arranged in banks so that the operation becomes continuous.

Through the use of recycling methods and since only tars and carbon residues are burned out as fuel during the heating cycle, this process has every aspect of competing with the Sachsse process.

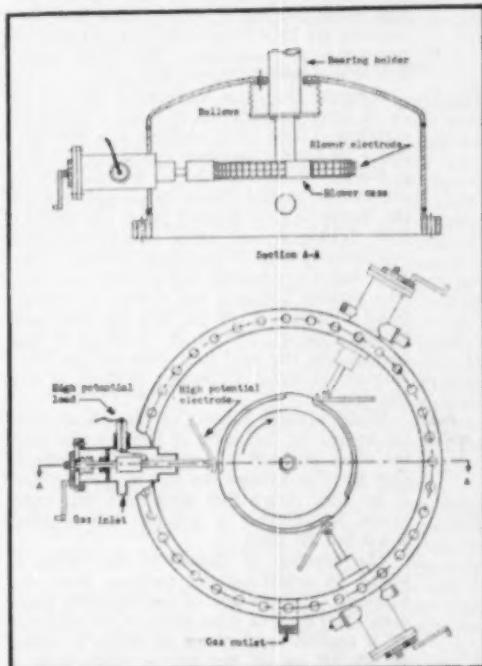
A pilot plant low pressure regenerative process was found in Germany by the allied investigators. This plant, according to a Fiat Report had a capacity of 14 lb. of acetylene per hr. The operating pressure was limited to 76 mm. mercury absolute when using pure methane as a feed gas. A slight increase in pressure favors the production of carbon black. With this delicate balance of pressure versus carbon black formation, operating difficulties could be expected with minor variations in composition of raw feed gas.

Pilot  
plant  
operated

Much of the equipment must operate at 0.1 atm. absolute. This coupled with the large volumes of water spray caused by the quenching operation requires large vacuum pumps and air tight equipment. Further, large capacity compression pumps are required to bring the gas up to a pressure suitable for operating the concentration system. No consistent data are available on costs. It has been stated, however, that 2.77 to 3.60 kwh. of energy and 2.5 to 3.0 lb. of methane are required per pound of acetylene. A commercial plant of relatively small output (1,900 tons per year) had been designed for Hungary. The cost was figured at about \$272 per ton of acetylene per year, yielding acetylene at 5.6 c. per lb., exclusive of royalty or amortization charges. Undoubtedly, a large plant would be more economical.

Dr. E. P. Schoch and his associates in the Bureau of Industrial Chemistry of the University of Texas have thoroughly studied the

Schoch  
process



Two views of the discharge chamber of the Schoch Process.

possibility of preparing acetylene by cracking natural gas through the use of an electrical discharge. Starting in January 1942, their research has led to a series of reports, some not yet released, based upon pilot plant operation which disclose the process. The use of the process is permitted through a license arrangement with the Board of Regents of the University.

Where natural gas or other hydrocarbons (gaseous or liquid) are readily available, the Schoch process becomes exceedingly attractive as a means for making acetylene.

Four  
major  
units

The Schoch process is unique and contributing to its interest are the favorable production costs and the low capital investment required. It consists of four major equipment units: an electric current control unit; a discharge chamber, cyclone and cooler; a unit for the removal of non-acetylene compounds; and an acetylene concentration unit.

The process uses ordinary 60 cycle current which is raised to the proper voltage and then by means of reactors and condensers is maintained at fixed amperage regardless of voltage drops during the operation of the system.

The discharge chamber is a gas-tight box containing a rapidly rotating blower wheel which is one pole of the electrical system, and a stationary flat metal shoe which serves as the opposite electrode. The design and position of this shoe is critical.

The rotor serves to feed the gas as a thin sheet through the wedge shaped channel formed by the shoe. Temperatures in the chamber are kept below 550 deg. F. Gases drawn from the chamber are freed from carbon and stripped of non-acetylenic compounds. The dilute acetylene is concentrated in the final unit.

It requires 1.6 lb. of hydrocarbon gas or 2.15 lb. of liquid hydrocarbon to make a pound of acetylene. When using methane as a feed gas, and a 10 percent acetylene containing product is formed, about one-third of the methane in the feed is cracked during its passage through the system and the balance passes out together with hydrogen and other non-hydrocarbon constituents. This off-gas, when produced from pure methane contains 55.5 percent methane, 44.4 percent hydrogen and a trace of ethane. Since 1,000 cu. ft. of the feed gas (methane) produces about 1,200 cu. ft. of off-gas of this composition the total heat units in the latter amounts to about 82 percent of those in the feed gas.

Heat  
savings

While a small amount of these heat units are needed for fuel, most of them can be used for other purposes. If recovered, or utilized, they serve to decrease the cost of manufacture. It has been shown that these extra heat units would be sufficient to generate the electrical power for the plant.

The question of disposal of the off-gas is solved by separating the methane from the hydrogen, utilizing one of four available processes. Only three of these processes are economical if applied to a volume of off-gas in excess of 100,000 cu. ft. per hr., or representing a plant producing 1,000 lb. of acetylene per hr.:

1. Expanding the off-gas from its pressure

of 125 psia. to atmospheric, thus liquefying the methane and separating the two components.

2. The Hypersorption process (using activated carbon) available from the Foster-Wheeler Corp.

3. A thermal diffusion process available through the Koppers Co.

To give an approximate idea of costs, the following data are given by Dr. Schoch:

a. Liquefaction separation: For an off-gas flow of 100,000 cu. ft. per hr., the turn-key cost of the unit would be \$350,000 as of February 1950. A unit ten times as large would cost about \$1,100,000. No utilities are required. The methane purity is greater than 98 percent and the hydrogen obtained is very pure.

b. Hypersorber separation: The turn-key costs of the units, exclusive of boiler, cooling tower, and contingencies, would be almost identical to those for the liquefaction units. The operation, however, involves utilities such as heat, water, steam and electricity. The purity of the products should be high.

For small  
plants

The fourth process mentioned above is not as economical but is still reported to be profitable and can be used in small acetylene plants, where the cost of the others would be prohibitive. In this process, the gases are separated by absorbing the hydrocarbons in an absorber oil such as is commonly used in natural gas recycling plants. It is estimated that such an absorption, followed by successive pressure reductions in a series of non-thermal flashings, will result in a 92 percent pure methane. It will contain about 8 percent hydrogen. It is estimated that a turn-key cost for a plant handling 100,000 cu. ft. per hr. of off-gas will cost \$175,000. Utility and equipment requirements are a gas compressor (120 brake hp.) to raise off-gas from 125 psia. and about 300 hp. expended in oil pumps.

The following example, serves to estimate the cost of gas per pound of acetylene with a gas recovery system in operation. Example: Assume the cost of recovering gas to be 6 c. per 1,000 cu. ft. In an efficient operation, one third of every 1,000 cu. ft. of feed results in 10 lb. of acetylene. Hence, the cost of gas per pound of acetylene would be  $[15/3 + (2 \times 6)/3]/10 = 0.9c$ .

The  
future

It is still too early to make any reliable predictions about which process or processes will be used to supply an acetylene based organic chemical industry with its raw material. One of the German processes, the Schoch process, an improved carbide process or even some process yet undeveloped may emerge as the most feasible. To a great extent the individual choice will be affected by the immediate economy of the synthesis for which the acetylene will be used.

One thing seems certain however. An acetylene based approach to the synthesis of new plastics, pharmaceuticals and many other industrial chemicals is at hand. The multi-million dollar pilot plant of General Aniline and Film Corp. for such investigations and those of other companies testify that industry has faith in the future of the triple bond.

# Check Your Design Jobs

**WHY? Save money, time, trouble**

**HOW? Answer Dr. Austin's questions**

**GEORGE T. AUSTIN**

Many chemical engineers view the completion of the process design as the completion of their responsibility. They feel that the filling in of the details of the design is more properly the function of a series of specialists—the mechanical engineer, the architect, the safety engineer and others.

In the broad sense this is true. The opinions, skilled help and advice of these men are needed and must be utilized throughout the design stage, but the fact is that the chemical engineer, and only the chemical engineer, is capable of understanding all the facets of a complete chemical plant design. The chemical engineer, if he has responsibility for the design, must regard himself as more than a specialist; he must be the general practitioner in charge of the case. This point of view is demanding of his time and effort. It means that he must learn many details of other fields of engineering. He must not be content with superficial analysis and he must know his own limitations and not hesitate to ask for help when needed. Most of all, to be successful, he must learn to work carefully and pay attention to details. Lack of attention to small, apparently insignificant items is the major cause of failure of design among engineers. A job, once completed and built, is full of trivia whose importance seems multiplied to the man who is unnecessarily hot or dirty or who must run madly about through a maze of pipes in order to turn off valves which should have been together in the first place.

If a plant is to succeed at all, those connected with it must want it to succeed. This is particularly true now with the modern, intelligent if un-

schooled, high-type chemical plant operator who can do wonders with almost any plant—if he tries. A sense of participation in the design of the plant by craftsmen, the future foremen and, where possible, the future operator of the new plant may well keep a terrible design operating smoothly.

When a plant begins to produce, the job is by no means done. The plant must continue to produce and do so without danger to life and limb if it is to be considered a success. This safe operation frequently comes about by expensive modification dictated by the safety man or fire protective group or other persons concerned with personnel safety. Maintenance of machinery, including lubrication, belt replacement, etc., is often left in the hands of millwrights or mechanics and the maintenance system becomes established only after breakdowns have shown the necessary places at which attention is required. This can be very expensive.

In order to be certain that a job is really completed, a check list of items which form the vital elements of almost every job which appears is desirable. A check list to be used at the start of a design and one to be used at or near the end of the design would be even more useful, but a single list has proved to serve well for both. The list which is presented here has evolved as a result of the author's experience. (He shudders to think of the price his employers paid to put items on this list.) Special conditions may add other items, but, in the main, if the questions listed here are covered, the great majority of the bugs of the process should be swatted.

A check list for the supervising engineer of a design job resolves itself into a series of questions concerning various phases of the process. These questions need not be answered by the supervisor, but it is his responsibility

to see that they are answered by someone qualified and that the answers are not based on a superficial study.

The division of the questions of the check list into six categories, as has here been done, is by no means essential, but the writer has found it convenient. Individuals might prefer to move items from one category to another; this is relatively unimportant. The important thing is that no design job is ever finished until all these questions are answered, all the various stated things done and all the possibilities opened up have been pursued to logical conclusions by persons adequately qualified to do so. More facets may need study, but only on rare occasions will there be fewer to consider.

## Preliminary Questions

When the preliminary design has begun to take shape in the minds of the research department men and before any significant work has been done in the pilot plant, the design engineer should take his place as a part of the research and development team. If he is thus allowed to carry his point of view to those concerned with the developmental stages, it may not be necessary for him to ask himself the preliminary questions and much time and effort may be saved. It is, however, generally advisable to ask:

1. Is the proposed solution rational? As a result of the compromises which are a part of everyday work, occasionally an irrational solution to a problem of process design will result. This must, of course, be altered.

2. How much of this design can be eliminated without sacrificing effectiveness? Startling economies may be possible by eliminating large parts of plants which perform only trifling, and perhaps unnecessary functions; rarely, whole sections may be eliminated.

3. Will alterations in the process as planned seriously disrupt other

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plans? This question should be considered with respect to the time when the proposed unit must produce, possible use of intermediates or byproducts at other places in the plant, etc. When this question is answered with a yes, the final design has become crystallized and detailed design should begin. Waiting too long to crystallize a design may waste much effort and greatly try the patience of the designer; it may also allow competitors to enter the field and establish profitable markets first. Fixing the design too soon may mean an inefficient plant. It is vital that designs never be set until the point of view of the experienced designer is understood and considered by the research and pilot plant groups.

### Equipment Design and Installation

1. Are the materials of construction which have been selected adequate to meet the existing corrosive conditions? Do not overlook the effect of spills and possible atmospheric conditions on the exterior and supports of vessels and machines.
2. Are the foundations, supports and buildings adequate? Are they unnecessarily complicated? Pay particular attention to the elimination or isolation of vibration effects by use of proper footings. Consider possible corrosion between vessels and supports.
3. Will the flooring selected withstand spill and drippage? Can it be easily kept clean? Can modification of floor or isolation of corrosives reduce its cost?
4. Will outdoor equipment be adversely affected by weather? Consider snow, rain, frost, ice, wind and floods.
5. Will modification in design or installation of parts allow duplicates within the design or within the plant which will reduce the number of spare parts which must be kept in stock?
6. Have provisions been made for the special conditions which occur when starting up and shutting down?
7. Are there enough instruments for proper operation and record? Are there too many? Has the effect of their possible failure on the operation of the system been considered? Are hand controls and bypasses provided so that maintenance without shut-down is possible?
8. Is there room for people and their tools? Can maintenance men get to equipment for servicing it? Is there any temporary storage space for product and raw material storage? Are

the aisles clear and can they remain clear when the plant is operating normally?

9. Can proper scheduling or redesign lead to multiple use of parts of the plant? For example, in a batch process can several reactions profitably be run in the same vessel?

10. Have there been several changes as the design progressed? If so, it is well to check to see that all parts of the design are based on the same projected production rate.

### Safety

1. Is heat, light, ventilation and/or air conditioning adequate under all weather conditions?
2. Are there any places where there are possible flows of dust or other types of contaminating, air-borne material between processing units, or between units and surroundings?
3. Is all electrical equipment of the proper class and group? Are switches conveniently located for normal and emergency operation?
4. Are adequate fire alarms, fire escapes, fire hydrants and first aid fire equipment (fire extinguishers) provided? Should the installation of an automatic or non-automatic sprinkler system be considered? Have you minimized the fire hazard in the plant by isolation of the more hazardous units? Is all equipment properly grounded to avoid the accumulation of static charges? Have provisions been made to discharge any static charges from belts, etc. without causing sparking? It is desirable to have prepared a discussion of the fire hazard of each unit, as installed, for the city and plant fire departments with detailed descriptions of special hazards and methods of overcoming them. It is highly desirable that the design engineer, or someone equally well informed, personally go over new installations with the chief of these firefighting units. The minutes which may be saved because of this preparation may save the whole plant from destruction in an emergency. Yearly review of these reports is desirable, but the written hazard report is indispensable. Where the plant has a safety man, he may logically perform this function, but he must be checked on all new plants because of his limited technical knowledge.
5. Are burglar alarms or central alarm services necessary? Should watchman's check stations be installed for regular inspections?
6. Are minimum minor first-aid materials available? Safety showers and eye baths may be desirable. Avoid

supplying any complicated medical supplies; men should not attempt to treat any but the most minor injuries themselves.

### Utilities and Services

1. Are the necessary utilities (light, water, distilled water, air, low pressure steam, high pressure steam, gas, sewers—sanitary, storm water and chemical, etc.) available without overtaxing the present systems? Are distribution systems equal to the load? It may occasionally be necessary to alter a process in order to avoid excessive rate of demand on one or more of these services. Consider possible substitution of low-pressure steam for high-pressure steam.
2. Can the utility situation be helped by slight design alterations? Can economies be effected by using turbines as drives instead of electric motors and using their exhaust for heating purposes? Can the judicious use of synchronous motors improve the power factor? Are capacitors economically justified?
3. Are sufficient means available to enable the accounting department to properly charge the units with their utilities requirements? Must any meters be installed for this purpose?

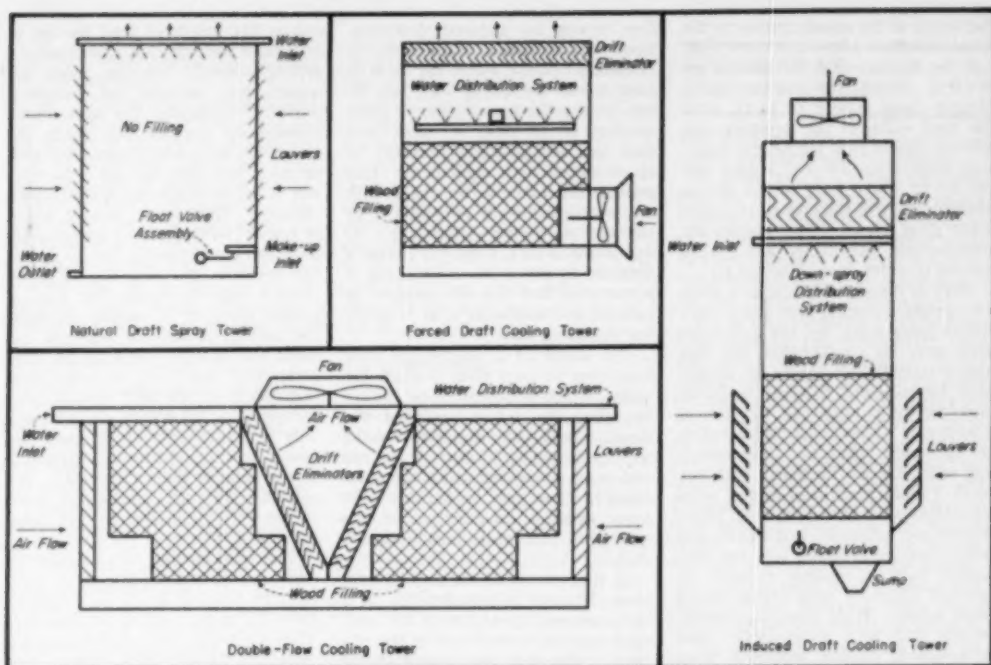
### Legal Regulation

1. Do all installations meet local building code and insurance requirements?
2. Must the permission of any government agencies be obtained for all or any part of the construction? Remember if alcohol is used or narcotic or food products are manufactured, government agencies have many regulations which must be met.
3. Have building permits been secured?
4. Are removal permits from the alcohol tax unit required to be supplied to any of your fabricators?
5. Are proper security regulations met?

### Continuing Service

1. Have you provided the group whose responsibility it is to run the plant with a detailed plan for its operation including some of the philosophy which went into its design, or are they supposed to be psychic? Strangely enough, such a booklet is practically never prepared, so, if the designer leaves the company's employ, or if he is too busy to follow up the design carefully later, many of his multiple
- Continued on p. 141





# Cooling Towers for Water Re-Use

The whys and wherefores of cooling towers may suggest greater water economy in your plant.

HOWARD E. DEGLER

During the past 40 years the progressive improvement of methods for cooling and subsequent re-use of water have been utilized in the following sequence: (1) rivers, lakes, wells, and cooling ponds, (2) spray ponds, (3) evaporative condensers, (4) natural-draft water-cooling towers, (5) forced-draft water-cooling towers, (6) induced-draft cooling towers, and (7) dry-surface coolers. Progress of the water-cooling equipment industry is apparent when it is realized that for a definite need, a modern cooling tower requires only 1 sq. ft. of ground area as compared to about 50 sq. ft. for the spray pond and about 1,000 sq. ft. for a natural cooling lake or pond. The continuous demand for a more compact design, better construction, lower cost, larger capacity, greater flexibility of operation, independence of

atmospheric uncertainties, and improved all-around performance has resulted in the modern induced-draft cooling tower.

## COOLING TOWER DEFINITIONS

A water-cooling tower is an enclosed device for evaporatively cooling water by contact with air. In atmospheric water-cooling equipment the heat transfer is accomplished partially by a transfer of sensible heat (about 25 percent) which raises the wet-bulb temperature of the air; but most of the cooling is due to an exchange of latent heat (about 75 percent) resulting from the evaporation of a small part of the circulating water. A natural draft water-cooling tower is one in which the air movement through the tower is dependent only upon atmospheric conditions. A spray-filled water-cooling tower (natural draft or mechanical) is one which is dependent solely on spray nozzles for water break-up. A deck-filled tower is one

which contains baffling to increase the water break-up of the distributing system and to provide additional wetted surface. A mechanical-draft water-cooling tower is one utilizing one or more fans to move air through the tower, the fans being an integral part of the tower. A forced-draft tower is a mechanical draft tower having one or more fans located in the air stream entering the tower. An induced-draft water-cooling tower is a mechanical draft tower having one or more fans located in the air stream.

## NATURAL-DRAFT COOLING TOWERS

For water-cooling requirements of less than 30,000 Btu. per min., the spray-filled natural-draft tower is satisfactory. The word "tower" used in this connection is a misnomer, as the design simulates a narrow spray pond with elevated nozzles and a high louver fence. As usually built, the nozzles spray downward from the top of the structure and the distance from

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the center of the nozzle system to the fence on either side is not more than half the distance that the nozzles are elevated above the water basin. Heights range from 6 to 15 ft., with the total width of the structure usually not greater than the height. Loadings range from 0.6 to 1.5 gpm. per sq. ft. of tower area, which means about one-fourth the area of an equivalent spray pond. The louvers are continuously wet, hence add to the surface of water exposed to the air.

Drift is considerably less in a properly designed natural-draft tower than in the spray pond, but the drift nuisance may be considerable; for this reason natural-draft towers are unsuitable for locations adjacent to buildings, or near expensive mechanical equipment. They must be located in an open area, broadside to the prevailing wind, and are inefficient with less than 3 mph. wind velocity and wind directions other than broadside. These towers are generally unattractive and since they are long and high for their width, must be securely anchored to prevent uplift or overturning during high winds. High pumping requirements and total dependence upon atmospheric caprice, especially wind (quantity and direction), are disadvantages.

A natural-draft tower either spray-filled or deck-filled can be used when the equipment served can stand a few degrees rise in the cold-water temperatures at low wind velocities; when the drift from the tower is not objectionable to the surrounding territory; and when it can be located so that the wind will not be obstructed by buildings, trees, etc.

Before the year 1920, large water-cooling systems were used with refinery condensing and steam-condensing operations; these plants were usually located where land was cheap enough to use spray ponds or long natural-draft cooling towers. Since then, numerous new markets have arisen, others grown, and with this shift requirements have become increasingly varied and exacting, necessitating refinements and specialized adaptations of water-cooling equipment.

#### MECHANICAL DRAFT TOWERS

The mechanical-draft tower consists of a vertical shell constructed of wood, metal, asbestos-cement board, or masonry, in which water is distributed near the top uniformly over the area, and falls to the collecting basin in the bottom, passing through air which is being circulated in the tower from bottom to top by forced or induced draft fans, or horizontally in double-

flow towers by induced draft-fans. Since the air passes counterflow or "crossflow" to the water, the air is in contact with the hottest water just before leaving the tower; hence a given quantity of air picks up more heat than the average equal quantity of air on natural-draft equipment. This permits the water to be cooled with the least quantity of air required by any type of cooling equipment. As movement of air through the towers is obtained by power-consuming fans, it is essential that this air quantity be reduced to a minimum so as to secure low operating cost.

The inside of a mechanical draft tower may be spray filled in which the water surface is presented to the air by filling the entire inside of the structure with water droplets from the spray nozzles, or it may be packed with wood filling over which the water cascades from top to bottom. In many cases, a combination of the spray-filled and wood-filled design is used.

In the spray-filled mechanical-draft tower, the area presented to the air is the combined surface area of the small drops present in the tower at any one time. The net, free cross-sectional area of the air spaces in a spray-filled tower is greater than that of the wood-filled tower for the same plan area. This results in lower air velocities and a shorter time of contact between air and water in the same size structure for a spray-filled tower. Before discharging to the open atmosphere, the water-laden exhaust air passes through a drift eliminator to remove entrained unevaporated water which might be carried from the tower by air movement.

In the wood-filled tower, pieces of lumber are laid horizontally across the space on as close centers, both horizontally and vertically, as required, without introducing too great a resistance to air flow. The water is distributed over the top layer by means of spray nozzles, troughs, splash heads, or through evenly spaced nozzles located in the floor of an overhead open-type water distribution basin, and drops from piece to piece of the wood filling as it progresses downward. As the air moves upward or across the filling or both, the latter presents a large wetted surface, repeatedly breaks up the falling drops of water, and continuously provides new drop surfaces whose integrated areas are several times that of the wood-fill area.

The efficiency of a mechanical-draft tower is improved by increasing the amount of filling, height, area, or air quantity. Increasing the height in-

creases the length of time the air is in contact with the water, without affecting seriously the fan power required, but increases the pumping power. Increasing the area while maintaining constant fan power increases the air quantity somewhat and increases the time this air is in contact with the water because of lower velocity. The surface area of water in contact with the air is increased in both cases. Increasing the air quantity decreases the time the air is in contact with the water, but since a greater quantity is passing through, the average differential between the water temperature and wet-bulb temperature of the air is increased, and this speeds up the heat transfer rate. Increased air quantities are obtained only at the expense of increased fan power, which increases approximately as the cube of the air quantity. Air velocities through mechanical draft towers vary from 250 to 400 fpm. over the gross area of the structure.

The performance of mechanical-draft towers is independent of wind velocity, hence it is possible to design them for more exacting performance. They require less space and less piping than atmospheric deck towers, and the pumping head varies from 10 to 25 ft., depending upon the design. Overall plant economy due to colder water temperature usually more than offsets the additional operating expense and initial cost as compared to atmospheric towers.

The forced-draft type of water-cooling tower has one or more fans located in the air entering the tower and is suitable for corrosive waters; it has the fan mounted near the ground level on a rigid foundation where it is easily accessible. Operating costs are high because of high fan-power requirements, and maintenance and depreciation both are high by modern standards. The greatest objection to the forced draft tower design is that the heated air leaves the top of the tower at a low velocity and is subject to "recirculation" to the fan inlet, this action reduces the performance, and could be as much as 20 percent. During cold weather, recirculation may cause ice formation on adjacent equipment and buildings as well as in the tower fan ring with possible resultant fan breakage. Their limited fan size (12 ft. or less) means more fans, motors, starters, and wiring in larger capacities than are needed by induced draft towers, which can use fans as much as 20 ft. in diameter. The location of fans on top of the tower makes the induced draft type a sounder structure and minimizes the

noise. It offers a neater appearance and has a ready adaptability to architectural treatment.

The counterflow (conventional) type of induced draft tower has the fan located at the top to provide vertical air movement across the filling and discharges it upward at a high velocity to prevent recirculation. Another type (small requirements) has the induced draft fan in one end, to provide horizontal flow. During the past ten years the demand for a more compact design, better construction, lower cost, larger capacity, more flexible operation, and improved all-around performance has produced the Double-Flow (also called cross-flow) induced draft cooling tower. This distinctive tower employs horizontal air flow with fans centered along the top, each fan drawing air through two cells paired to a suction chamber which is partitioned midway beneath each fan and fitted with "drift eliminators" that turn the air upward toward the fan outlet. This tower obtains a horizontal air movement as water falls in a cascade of small drops over the wood-filling and across the air stream with low resistance to air flow. The air travel is longer than with the conventional counter-flow design.

Double-Flow water-cooling towers employ a low pumping head, varying from 12 to 25 ft. Operating advantages include: horizontal (crossflow) air movements as water falls in a cascade of small drops over the filling and across the air stream, offers less resistance to air flow, therefore a lower draft loss, has longer air travel than is practical with the conventional design, open water-distribution basin which is accessible for cleaning during operation, and has a close-space wood diffusion deck under the water basin to provide uniform water distribution to the wood filling. Most cooling tower manufacturers limit the water loading to a maximum of 6 gpm. per sq. ft. because of the blanketing effect of the spray, but heavier loadings up to 10 gpm. per sq. ft. are possible in cross-flow towers. A modern Double-Flow water-cooling tower occupies less than one-twentieth of the area required by a spray pond for equivalent service.

#### COOLING TOWER COSTS

Improved designs have continuously reduced costs and space requirements during the past 25 years, despite the 1947-49 inflationary period. Even greater reductions have been made in fan horsepower, number of fans required, and the water pumping heads required with improved performances

and flexibility. Space requirements are less, appearance is better, drift loss has been practically eliminated, and structural details have been simplified and improved, with resultant lower maintenance and greater safety. The increased costs of labor and materials for modern water-cooling towers have been offset by better engineering as reflected by continued improvement, simplification, and closer adaptation to the specific requirements of each application, and developing every opportunity for wise reductions in the cost of production and operation.

#### TOWER SELECTION

The lowest temperature to which water may be cooled in cooling towers is the temperature of adiabatic saturation, i.e. the wet bulb temperature of the ambient air. Performance is measured in terms of "approach" of cold-water temperature to wet-bulb temperature of the air, when cooling the water through some desired "range." For a definite heat load, the approach to be obtained would depend largely upon the geographical location (design wet-bulb), the range, and the type of water-cooling equipment. A close approach requires a larger and more expensive tower than a long approach; for instance, the cost of a tower for a 5 deg. F. approach would be 14 to 2 times that of a unit for a 10 deg. F. approach with a given heat load.

Before the characteristics of a specific water-cooling apparatus can be judged desirable or undesirable for a given heat load and wet-bulb temperature, a survey should consider the importance of each of the following items: first cost including all necessary auxiliaries, area, height, weight, effect of wind velocity and direction, rigidity of structure to withstand high winds, safety, conformity to building codes, drift nuisance, make-up water requirements and cost of chemical treatment if needed, total power for pumping (plus fan operation in the case of mechanical draft), maintenance, available locations (with due thought to possible future expansion, wind restrictions, space cost, proximity and accessibility, etc.), appearance, the equipment's operating flexibility for the most economical conformance to varying loads or seasonal changes, and other considerations occurring with regard to a specified application.

This article consists of excerpts from the author's paper "Cooling Towers for Water Re-Use in Process Industries" presented before the New York Section of the American Institute of Chemical Engineers, Nov. 17, 1949.

#### YOUR DESIGN JOB

*Continued from p. 138*

use, short-cut plans are never known to the men who might use them.

2. Have you a written, long-range plan for the maintenance and inspection of each piece of equipment in your plan? Is this information in the hands of the man or men whose responsibility it will be to schedule and perform these tasks as you wish?

If you have answered all these questions carefully and thoughtfully, you will have made few mistakes. If the design is now done, and you are ready to begin construction, you might do well to ask yourself again how much of the plan can be eliminated without sacrificing efficiency, for you may occasionally be able to look back and eliminate things from the view you have here that you could not foresee earlier. If, at this point, you do not feel that you could start over and design a better plant than you have just designed, you probably don't know enough about the process to design it.

One additional use which may be found for this check list is to acquaint young engineers with the scope of a problem, for they have a strong tendency to consider that the fulfilling of a set task in a routine way is sufficient. Many feel that the completion of the process design completes their function. Plans built by engineering groups who are short on chemical training have a way of developing little peculiarities which require much time and considerable expense to eliminate. Somewhere along the line between conception and production, someone must answer all the questions proposed here. When the chemical engineer takes this responsibility upon himself, a minimum of bugs may be expected in the final plant. When he leaves them to others, he must expect his process design to bear the blame for any oversights and annoyances.

If one has sufficient courage, much may be gained by preparing an "error sheet" about six months after the completion of a plant. On this sheet (or sheets) list all the errors in design which have come to light during the erection and operation of the plant. Keep notes during the construction so that this sheet may be complete. Let the operators and foremen help you prepare it. Circulate it among your subordinates. Frequently money-saving eye openers turn up here—particularly with reference to new and unusual ideas. These sheets are great ego-deflaters, but they do help prevent making the same mistakes twice.

# Pick Off Economic Insulation Thickness

Economic thickness of insulation for flat or curved surfaces, either single or in combination, found quickly by simple procedure.

R. A. BAYARD

Heat insulation for industrial equipment is ordinarily put on in layers, each succeeding layer of equal thickness of the same material increases the resistance to heat loss but saves less heat than the preceding one, so that there is a thickness whose hourly life cost is just equal to the hourly cost of the heat it saves.

The economic thickness of insulation is had when  $PYT (L_1 - L_2) = C\Delta t$ . Then the total cost of the  $\Delta t$  in. of insulation equals the value of heat it saves during its life. The cost of any additional insulation will cost more than the heat it saves, and any less insulation will lose heat which could be saved by application of insulation, costing less than the value of the heat lost.

$\Delta R = \Delta t/k$ , so for  $\Delta R = 1$ ,  $t = k$  and  $PYT (L_1 - L_2) = Ck$ . Thus, at the point of economic thickness, for a difference of 1 in the chart  $R$  lines, there must be a corresponding difference on the proper HFT line of  $kC/PYT$ .

## EXAMPLE 1—FLAT SURFACE, SINGLE INSULATION:

Flat surface, single insulation, HFT 500 deg. F., is to be covered with 85 percent magnesia ( $k = 0.5$ ) costing 60c. per bd. ft. in place. Heat used 24 hr. per day costs 3 mills. Insulation life is 10 yr.;  $kC/PYT = (0.5 \times 60) / (3 \times 10 \times 1) = 1$  c. To use the chart, enter on the hot face 500 deg. F. line, Fig. 1 and find a point where there is a 1 c. difference between two  $R$ 's whose difference is 1. For this problem it comes between  $R = 9$  and  $R = 10$

R. A. BAYARD is a mechanical engineer who has been in charge of electric furnace design projects for some 20 yr. Office—1700 Sun Life Bldg., Montreal.

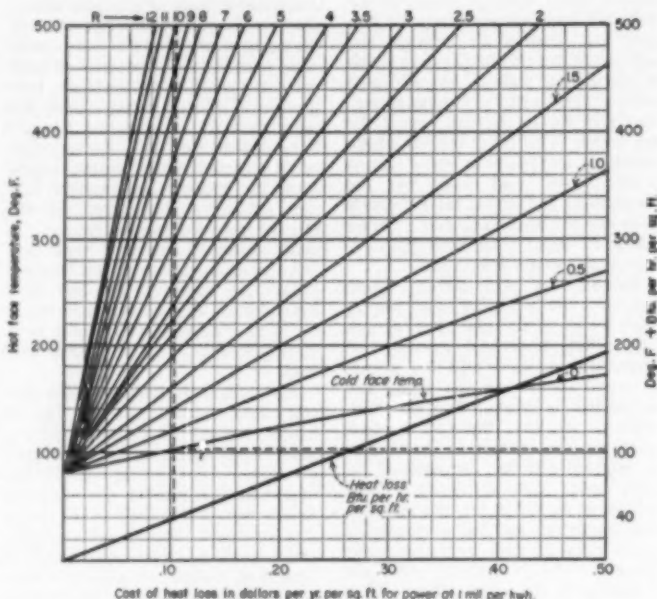


Fig. 1—Chart for picking off economic thickness of insulation—method is described in Example 1. Fig. 2 is an extension of this chart.

and the economic insulation thickness is  $kR = 0.5 \times 10 = 5$  in. The heat loss per hour per square foot given by the chart is 40 Btu. and the CFT is 103 deg. F.

## EXAMPLE 2—CURVED SUR-

### FACE, SINGLE INSULATION:

Use the same conditions as above for the outside of a 10-in. O.D. tube. In this case each additional layer has a larger diameter and consequently costs more and has a greater heat loss area than the preceding one. The ratio  $r$  of the average surface of the various layers to the surface of the tube is approximately  $1 + t/D$ , where

$t$  and  $D$ , in the same units, are the thickness of the insulation and the O.D. of the tube. The economic thickness for cylindrical surfaces  $t_c =$  approximately  $t_p(D + 0.5)/(t_p + D)$  where  $t_p$  is the economic thickness found from the chart for flat surfaces.  $t_c$  for the 10-in. tube =  $(5)(10 + 0.5)/(5 + 10) = 3.56$  in.

## EXAMPLE 3—CURVED SUR-

### FACE WITH COMBINATIONS OF INSULATION:

Combinations of refractories and insulations are used in high temperature work because strength and refractoriness are not obtained with ma-



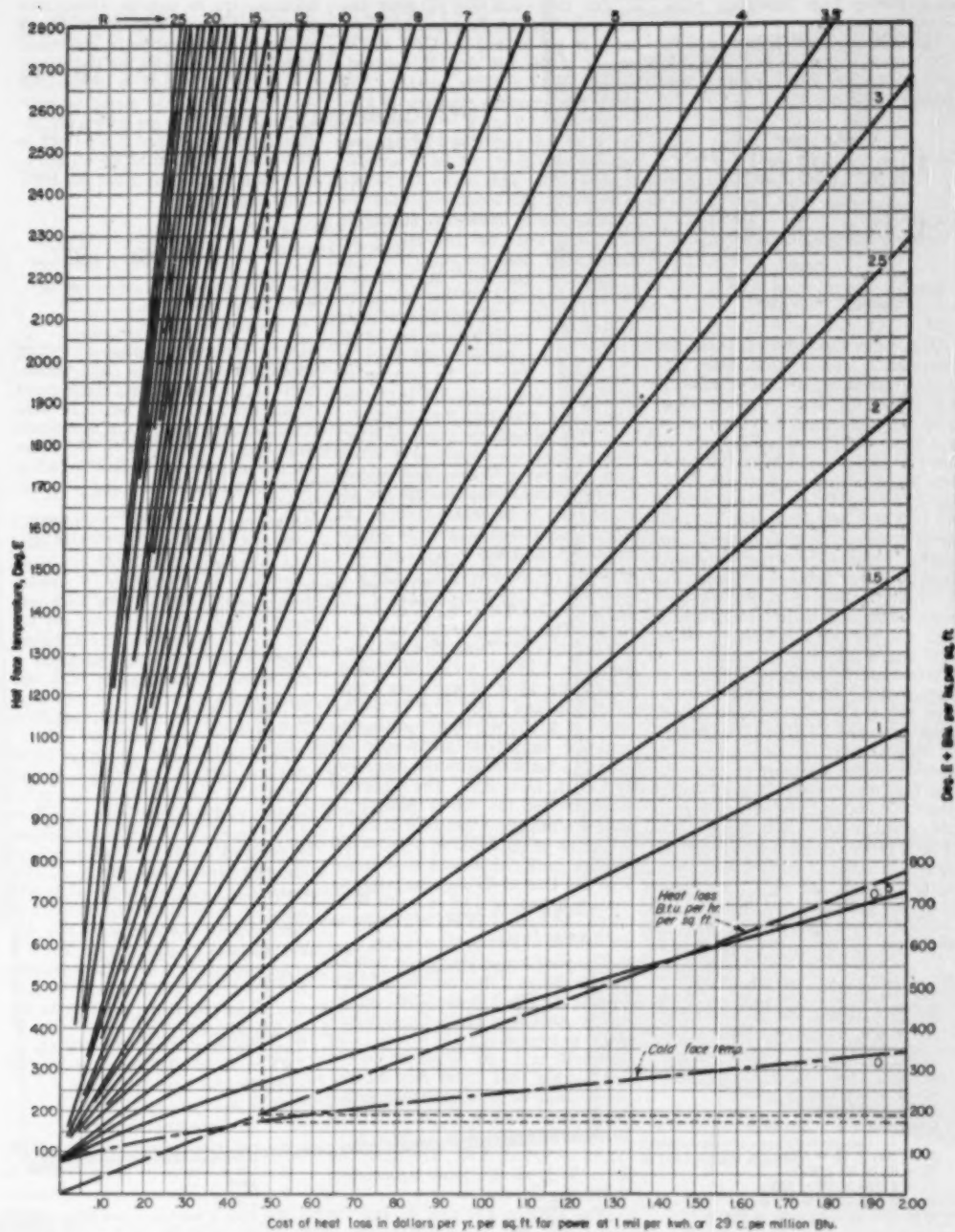
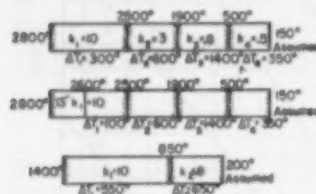


Fig. 2—Chart for picking off economic thickness of insulation (extension of chart in Fig. 1). Both charts give also heat loss and cold face temperature values for losses to still air at 50 deg. F., surface emissivity 0.8 (hot face temperature and resistance  $R$  known)—whether economic thickness is used or not.



materials having high insulating properties.

The following example is for a 10-ft. I.D. furnace in use 24 hr. a day, life 10 yr., power cost 3 mills, furnace temperature 2,800 deg. F.



First select a refractory to stand the temperature and chemical conditions imposed on the inside face of the wall. Say a brick ( $k = 10$ ) costing 45 c. a bd. ft. in place will do. Then select the next better insulating brick to meet conditions, which for this problem might be a refractory brick standing 2,500 deg. F.,  $k = 3$ , and costing 40 c. These two refractories are ordinarily enough to give strength and rigidity to the walls so that a standard heat insulation standing 1,900 deg. F.,  $k = 0.8$ , costing 60 c. may be used next. The next better insulation is say, 85 percent magnesite, standing 500 deg. F.,  $k = 0.5$ , costing 30 c. There must be sufficient thickness of each material to reduce the temperature to that the following material will stand. Assume a CFT of 150 deg. F. If this assumption were correct, it would only be necessary to enter the chart on the 150 deg. F. line to meet the CFT line and rise vertically from this point to the 2,800 deg. F. line. The  $R$  at this point is 20. From the figure, however, it may be seen, if  $r_1$ ,  $t_1$ ,  $t_2$ ,  $k_1$ ,  $k_2$ ,  $k_3$ , and  $C_1$ ,  $C_2$ ,  $C_3$ , represent the resistance, conductivity and cost per board foot of each material that:

$$\begin{aligned} \Delta T_1/\Delta T_2 &= r_1/r_2 = 300/600; r_2 = 2r_1 \\ \Delta T_1/\Delta T_3 &= r_1/r_3 = 300/1400; r_3 = 4.66r_1 \\ \Delta T_1/\Delta T_4 &= r_1/r_4 = 300/350; r_4 = 1.17r_1 \\ R &= r_1 + r_2 + r_3 + r_4 = 8.83r_1 \end{aligned}$$

$$\begin{aligned} t_1 &= k_1/r_1 = 10r_1 \\ t_2 &= k_2/r_2 = 6r_1 \\ t_3 &= k_3/r_3 = 3.72r_1 \\ t_4 &= k_4/r_4 = 0.58r_1 \\ t &= t_1 + t_2 + t_3 + t_4 = 20.3r_1 \end{aligned}$$

$$\begin{aligned} C_1 &= 10r_1 \times 45 = 450r_1 \\ C_2 &= 6r_1 \times 40 = 240r_1 \\ C_3 &= 3.72r_1 \times 60 = 223r_1 \\ C_4 &= 0.58r_1 \times 30 = 17.4r_1 \\ C &= C_1 + C_2 + C_3 + C_4 = 930.4r_1 \end{aligned}$$

The average resistance per inch is  $8.83r_1/20.3r_1 = 0.434$  or average  $k = 1/0.434 = 2.3$ . The average cost per inch is  $930.4r_1/20.3r_1 = 45.8$  c.  $Ck/PYT = 106/30 = 3.52$  c. for  $\Delta R$

1. For this value Fig. 2 gives the economic  $R$  as 14, heat loss 190 Btu. per sq. ft. per hr. and the CFT as 170 instead of the 150 deg. F. assumed. From  $R = 14 = 8.81r_1$ , get  $r_1 = 1.59$  giving the economic thickness of  $k = 10$  brick as 15.9 in.,  $k = 3$  brick 9.55 in.,  $k = 0.8$  insulation 5.9 in. and magnesite 0.925 in.; a total of approximately 32 in. This is the flat surface figure when the whole wall thickness is considered as insulation. It may be noted that since the 150 deg. F. assumed CFT does not equal 170 deg. F. given by the chart, the economic thickness obtained will not be correct. This is strictly true, but the estimate of the CFT would have to be far off to make an appreciable difference in the answer. This can be seen by assuming a compromise CFT of 160 deg. F. and reworking the problem.

If 13-in. of brick are necessary as furnace wall and not considered as insulation, proceed as before, first finding the temperature drop through the 13-in. of brick to be  $(13/10)140 = 182$  deg. F., say 200. This gives an average insulation resistance of 0.492 and cost of 46.2c. per in.;  $Ck/PYT = (46.2 \times 1/0.492)/3 \times 10 \times 1 = 3.13$ c. From Fig. 2 for 2,600 deg. F.,  $R$  economic = 14. This gives  $r_1 = 0.65$  and  $t_1 = 6.5$  in.,  $t_2 = 11.7$  in.,  $t_3 = 7.25$  in., and  $t_4 = 1.13$  in., a total of 26.6 in. Adding the 13 in. of wall gives a total of 39.6 in. and a final  $R$  of  $14 + 13/10 = 15.3$ . For the 10 ft. furnace, the ratio of insulation thicknesses for round to flat surfaces is the reciprocal of  $1 + t_1/D = 0.79$ . The economic thickness for the round furnace in nearest standards is then  $0.79 \times 6.5 + 13 = 18$  in. of firebrick, 9 in. of insulating brick, 5.5 in. of  $k = 8$  insulation and 1 in. of 85 per cent magnesite making a total of 33.5 in. with  $R = 13.66$ .  $33.5$  in. -  $13$  in. =  $20.5$  in. of insulation.

The joint temperatures may now be checked to see if they are not too high by entering Fig. 2 on the 2,800 deg. F. line to meet  $R = 13.66$ . Go vertically down to meet  $R = 13.66 - r_1 = 13.66 - 18/10 = 11.86$ . Opposite on the left margin read 2,480 deg. F., the temperature of the firebrick insulating brick joint. Follow the same vertical line down to meet  $R = 11.86 - t_2 = 11.86 - 9/3 = 8.86$ . This gives the  $k = 3$ ,  $k = 0.8$  joint temperature 1,890 deg. F., and so on.

The CFT is 170 deg. F. and the loss is 195 Btu. for a flat surface or  $195 \times 1.4 = 272$  Btu. for the curved surface, 1.4 being the ratio of average curved to inside surface from  $r = 1 + t/D$ .

How closely this gives the economic

thickness can be seen by adding and subtracting 1 in. of insulation made up in the same proportion as the materials in the wall.  $R$  for the insulations is  $5$  in./ $10 + 9$  in./ $3 + 5.5$  in./ $0.8 + 1$  in./ $0.5 = 12.36$  giving an average of  $12.36/20.5 = 0.604$  per in. The average cost per board foot is  $28.2$  c. flat or  $28.2 \text{ c.} \times 1.4 = 39.5$  c. for round. From the chart for HFT 2,800 deg. F.:

	Cost of Heat Lost, per Sq. Ft.	Difference, 10-Yr., 3-mil Power
$R = 12.36$	50c.	
$R + 1 = 13.36$	49.5c.	38.5c.
$R - 1 = 11.36$	50.5c.	66c.

Had 1 in. more insulation costing approximately 39.5 c. been added, only 38.5 c. would have been saved giving a net loss of 1c. per sq. ft. Had 1 in. less been used, the loss would have been 64 c. in heat vs. 39.5 c. for insulation giving a net loss of 24.5 c. thus checking 20.5 in. as the economic thickness.

#### EXAMPLE 4—PREDETERMINED WALL JOINT TEMPERATURE:

A rectangular brick cell holds an electrolyte at 1,400 deg. F. which freezes at 850 deg. F. The brick wall must be thick enough so that any liquid seeping through will freeze before reaching the insulation. Required is the economic thickness of brick and insulation;  $k$  for brick = 10, cost 40 c. and for insulation  $k = 0.8$ , cost 60 c. Cell life 3 yr., heat 2 mills per kwh.

Find per average inch,  $R = 0.199$  and  $C = 41.5$  c. For  $\Delta R = 1$ ,  $Ck/PYT$   $(41.5 \times 1/0.199)/(3 \times 2 \times 1) = 34.6$  c. From chart economic  $R = 3.2$ . This gives  $r = 1.47$  and thickness of brick  $r_1k_1 = 14.7$  in. (Use nearest standard 13.5 in. for which  $r = 1.35$ .) Enter Fig. 2 on the 850 deg. F. line to intersect an  $R$  such that  $R + 1.35$  intersects the 1,400 deg. F. line vertically above it. This occurs where  $R$  is approximately 1.47. The economic  $R$  for the conditions is  $1.35 + 1.47 = 2.82$  for which the chart shows loss of 406 Btu. and CFT = 240 deg. F. The thickness of insulation is  $r_2k_2 = 1.47 \times .8 = 1.176$  in. Use 1 in. of insulation.

#### NOMENCLATURE

- $P$  = Cost of heat in mills per kwh., or in multiple of 20c. per million Btu.
- $Y$  = Life or amortization time of insulation in years.
- $T$  = Hours of equipment use per year divided by 8,760.
- $L$  = Value of heat lost in cents per square foot per year for heat costing one mill per kwh or 20c. per million Btu.
- $C$  = Cost of insulation in cents per board foot in place.
- $t$  = Thickness of insulation in inches.
- $R$  = Thermal resistance (reciprocal of total conductivity).
- $k$  = Conductivity per inch of thickness.
- HFT = Hot face temperature.
- CFT = Cold face temperature.

**Tested performance,  
superior workmanship  
and lower cost . . .**

**WITH PFAUDLER'S STANDARD LINE  
OF STAINLESS STEEL EQUIPMENT**



**Q. Of what does Pfaudler's standard line of Stainless Steel process equipment consist?**

**A.** A series of engineered stainless steel jacketed reaction vessels with motor driven agitators ranging in size from 5 to 500 gallons; jacketed evaporating pans in 12, 60 and 150 gallons; heat exchangers and condensers in various designs and capacities.

**Q. What has guided you in designing this equipment to assure good performance?**

**A.** Over 20 years of engineering experience in designing all types of stainless steel chemical process equipment. The most efficient designs were selected from this experience from the standpoint of size, design, agitation, heat transfer and cost. Pfaudler pioneered in perfecting the technique of stainless steel welding.

**Q. How do you handle various requirements from standpoint of corrosion resistance?**

**A.** Stock units are made of type 316 but ample inventories are carried of types 304, 321 and 347 for quick delivery. Pfaudler also has facilities for heat treating and passivating where required.

**Q. How can I get the complete story?**

**A.** Ask for Bulletins 823 and 837 or call the nearest Pfaudler sales engineer.

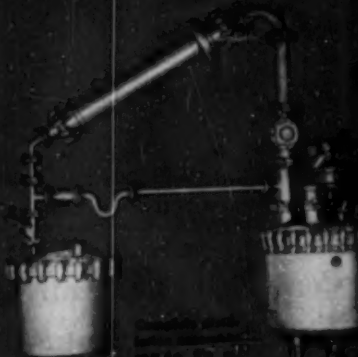
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# Pfaudler

**THE PFAUDLER CO., ROCHESTER 3, NEW YORK**

Engineers and Fabricators of Corrosion Resistant Process Equipment

**GLASS-LINED STEEL**

Hastelloy—Aluminum

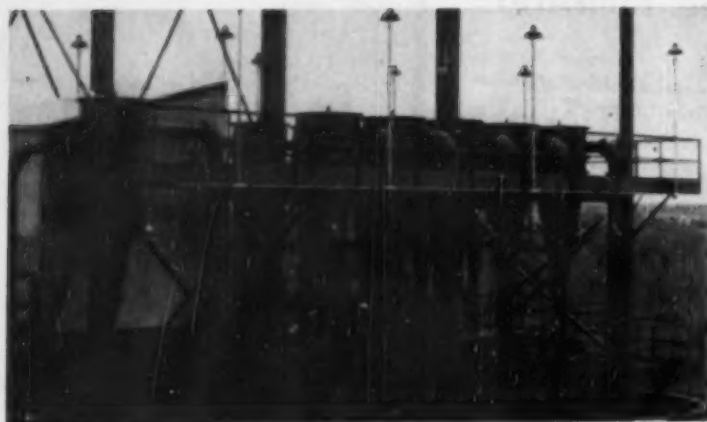
Tantalum—Carbon Steel

Solid or Clad Stainless Steel

Nickel, Inconel, Monel

# Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor



Part of a battery of 10 DorrClones installed in new phosphate washer and flotation plant of American Cyanamid Co. at its Sydney Mine, Florida, to deslime wash plant screen undersize.



Phantom view of DorrClone separator for solids in suspension.

## Centrifugal Concentrator and Classifier Available for Plant Scale Use

**The DorrClone has interesting possibilities as a classifier and thickener for fine suspended solids.**

(146A) It was announced some time ago that the Dutch States Mines cyclone would be produced and sold throughout the world by the Dorr Co. for all applications other than separations by specific gravity difference. Dorr has now put the machine into production and is prepared to supply it for applications such as hydroseparation, micron-size separations and the dewatering of deslimed products. Its principal field appears to be in the preparation of metallic and non-metallic mineral raw materials, for example as part of the flow-sheet in phosphate rock washing.

The new separator resembles an ordinary dust-collection cyclone but differs in being designed to operate on a liquid containing suspended solids, rather than on a gaseous suspension. The principle of operation is very similar. The feed pulp, a mixture of vari-sized solids suspended in a liquid, enters the unit tangentially under pressure near the top. The

feed spirals downward in the conical section toward the apex valve. Coarser particles continue downward and leave as underflow by the tail pipe. Finer fractions turn and spiral upward through the center of both conical and cylindrical sections, and out through the vortex finder as an overflow product.

Capacity and point of size separation are primarily functions of the size and pressure drop used, although other design details and adjustments are also of importance. Sizes at present, based on inside diameter of the cylindrical section, are 3, 6, 12 and 24 in. With operating pressures from 5 to 100 psi. (the higher pressures for finer separations), flow rates in these sizes range from 5 to 600 gpm. per unit.

Low installed cost and floor space requirements are advantages of the DorrClone, together with its ability to make separations in the micron size range on flocculent pulps with-

out dispersing agents or excessive dilution. In general, the separator is said to produce a cleaner underflow than comparable equipment of other types.

Among suggested uses are: desliming of non-metallic minerals such as cement rock, phosphate rock, ilmenite, barite and fluorite, ahead of the concentrating step; de-gritting of pigments and fillers; dewatering of hydro-separator underflow without size separation; classifying down to 10 microns on such materials as abrasives, aluminum hydrate and enamel frits; and thickening of deslimed products coarser than 10 microns where a clarified effluent is not needed, for example, on flotation concentrates and tailings.—The Dorr Co., Barry place, Stamford, Conn.

### OPERATES ELECTRICALLY: Vapor Heater

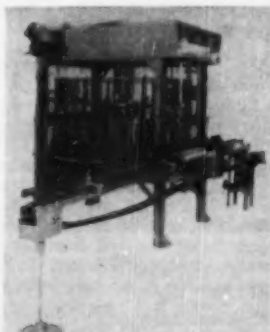
(146B) Speedytherm is the name of a new electrically heated vapor boiler for process applications, introduced by Livingstone Engineering Co. This boiler is of the electrode type but instead of boiling water, boils a liquid having a considerably lower vapor pressure at the same temperature. At 40 psig., for example, saturated steam has a temperature of 287 deg. F., while the vapor temperature of Speedytherm liquid at the same

pressure is 465 deg. F. The new system is suitable for temperatures in the range from 400 to 550 deg. F. where working pressures must be limited. The vapor can be delivered and circulated through ordinary piping, thus making it suitable as a heating medium for jacketed kettles, autoclaves, platens and molds. The new system, it is claimed, is substantially lower in cost than comparable high-temperature heating systems.—Livingstone Engineering Co., 100 Grove St., Worcester 5, Mass.

#### REDUCES EQUIPMENT COST:

### Reactivation Fan

(147A) A new development, intended primarily for use in large dehumidification units, is a reversible fan for reactivation and cooling that is now being offered by Pittsburgh Lectrodryer Corp. In the past it has been customary to provide a unidirectional fan for handling the reactivating and cooling air, and to provide a system of bypass dampers, ducts and reversing valves to enable the air to be reversed when changing from the reactivating to the cooling portion of the cycle. In large units a considerable part of the cost is attributable to the reversing equipment. Through employment of a reversible fan the same result is achieved at considerably lower cost and with a much simpler installation.—Pittsburgh Lectrodryer Corp., P. O. Box 1766 Pittsburgh 30, Pa.



#### HANDLES CORROSIVES:

### Bottle Filler

(147B) Latest of the bottle filling machines made by the MRM Co. is a 30-spout, fully automatic, rotary liquid-filling machine, with overhead drive, designed specifically for filling highly corrosive materials such as sodium hypochlorite into bottles. The machine features stainless steel construction for most parts in contact with the solution, with non-metallic

parts in contact made of suitable plastics. The machine can fill from fractional ounces up to gallons. It occupies a floor space of 7x12 ft. and uses three motors of 1, 1/2 and 2 hp.—MRM Co., 191 Berry St., Brooklyn, N. Y.



#### GAS-TIGHT CONSTRUCTION:

### Insulated Oven Door

(147C) Insulated to withstand high temperature operation, and constructed so as to be gas and vapor tight, a new door for ovens and drying rooms has been developed by Jamison Cold Storage Door Co. The door is of rigid metal construction, resistant to warpage and insulated in a continuous manner with heavy-density fiber glass. The door is provided with adjustable sealing bars on all four sides against which the heat-resistant pliable gasket is strongly compressed when the door is closed. A positive three-point interconnected fastener is provided, which operates center, top and bottom fasteners simultaneously and compresses the gasket. It is equipped with a leak-proof inside release handle to permit instantaneous escape if persons should be trapped within the enclosure. A peep-hole emergency release panel is standard equipment. If desired, a track rail notch can be provided.—Jamison Cold Storage Door Co., Hagerstown, Md.

#### FOR LIMITED NPSH:

### Vertical Centrifugal Pump

(147D) A pump designed primarily for use where the net positive suction head (NPSH) is limited, or where installation space is limited, has been introduced under the name of Hydro-Line by the Peerless Pump Div. of Food Machinery & Chemical

(Continued)

### More Information . . .

To learn more about any item described here, circle the item's number on the Reader Service Postcard inside the front cover.

### This Month . . .

As our new feature this month, this department has decided to reverse the world trend and adopt a slogan of "More for your money." It is up to you, gentle reader. We invite your suggestions. What can we give you in news of new equipment that you are not now getting? More items and shorter, or fewer of them in more detail? Tell us what you want and we'll do our best to see that you get it. While deciding, may we suggest you try a few samples for size? For instance, that ingenious pressure vessel bolt which can't be opened under pressure, on p. 148. Or the simplified electron microscope, on p. 150. For a new control variable, there is a recording turbidimeter on p. 152, while the dry-type process cooler on p. 154 ought to strike a responsive chord if you are in one of the water-short areas.

### Next Month . . .

If you feel that next month can be more useful to you than this month, don't forget the invitation to send in your suggestions. As a hint of things to come, look for new Vinylon-N protective clothing, a pump for hydraulic testing that holds the pressure automatically, and a new flame-sprayed coating for equipment.

### Marshall and Stevens Indexes of Comparative Equipment Costs

(1926 = 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, *Chemical Engineering*, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see *Chemical Engineering*, Feb. 1950, p. 122.

Industry	Mar. 1949	Dec. 1949	Mar. 1950
Average of all . . . . .	145.1	159.4	166.0
<b>Process Industries</b>			
Cement mfg. . . . .	139.5	155.3	155.5
Chemical . . . . .	147.5	143.8	143.5
Clay products . . . . .	154.5	150.3	150.5
Glass mfg. . . . .	157.6	153.4	153.6
Paint mfg. . . . .	160.8	156.6	156.8
Paper mfg. . . . .	161.1	156.9	157.1
Petroleum ind. . . . .	163.9	159.7	159.9
Rubber ind. . . . .	168.3	162.1	162.3
Process ind. avg. . . . .	164.9	160.7	160.9
<b>Related Industries</b>			
Elect. power equip. . . . .	149.1	144.9	145.1
Mining, milling . . . . .	148.2	144.0	144.2
Refrigerating . . . . .	161.2	178.6	174.8
Steam power . . . . .	162.3	162.0	162.2

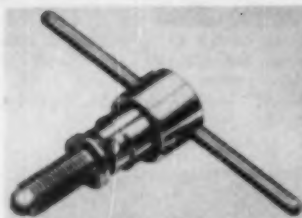


Corp. The pump consists essentially of a vertical, close-coupled turbine pump enclosed in a steel jacket or barrel. The pump is usually installed over a dry pit so that the barrel portion is below ground while the direct-connected motor, suction and discharge connections are above ground. Pumps of this type are available in capacities up to 5,000 gpm. for heads up to 1,500 ft. They are suitable for handling liquids at temperatures up to 400 deg. F., including petroleum hydrocarbons, hot or cold water, acids, bases, salt solutions and other chemicals. The pump can be equipped with either a packing box or a mechanical seal, with the latter recommended especially by the manufacturer for use at higher pressures. The construction employed is said to insure simplified maintenance, as well as certain operation, and freedom from the possibility of cavitation. —Peerless Pump Division, Food Machinery & Chemical Corp., Los Angeles 31, Calif.



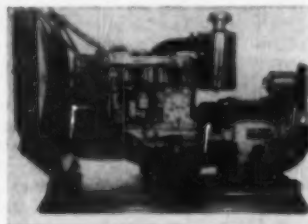
ONE-MAN OPERATION:  
**Hopper-Car Unloader**

(148A) For removing solid materials from hopper cars to a stockpiling belt conveyor or other take-away device, Lippmann Engineering Works is offering a new belt-type hopper-car unloader available with either electric motor or gasoline engine. The machine can be provided with either pneumatic tires or steel wheels. It is said to be balanced so perfectly that it can readily be set in place under the railroad car by one man. A single belt takes care of both the horizontal run and the elevation of material removed from the car. Power is transmitted to the belt by chains running in a guide channel track along each side of the belt, to which belt-fastened flights have been attached. Solids are prevented from leaking into the chain by a sealing rubber strip at either side of the conveyor. The unit is equipped with anti-friction bearings throughout. —Lippmann Engineering Works, 4603 West Mitchell St., Milwaukee 14, Wis.



PREVENTS UNSAFE OPENING:  
**Pressure Vessel Bolt**

(148B) Known as the Wilson-Dunton, a new safety release pressure bolt is being offered for use on pressure vessels which must not be opened while the vessel is under pressure. The bolt is actuated by pressure within the vessel in such a way that the handle-bar is disengaged and can be rotated freely without imparting turning movement to the bolt proper as long as pressure is communicated from the vessel to a piston within the bolt head. Only after pressure is fully released will the handle automatically return to bolt-turning position so that the bolt can be removed. The new device thus offers positive protection against the possibility of accidental opening of vessels still containing pressure. —Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N. Y.



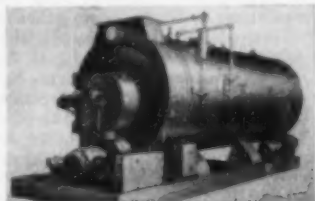
DIESEL-OPERATED:  
**Generator Units**

(148C) Produced in eight sizes ranging from 40 to 250 kw., a new line of diesel-operated electric generator units has been announced by Cummins Engine Co. These ratings are available in 60-cycle units. For 50-cycle operation there is a slight derating in kilowatt capacity. These units are designed for continuous service applications where the unit is the primary source of power. However, they are also suitable when specially engineered for somewhat higher power ratings in standby or emergency power service. They are provided with either marine-type or radiator-type cooling systems and are equipped with all necessary controls. Each unit consists of an engine direct-connected to a

single-bearing generator, both units being mounted on a common structural steel base.—Cummins Engine Co., Columbus, Ind.

VERSATILE SERVICE:  
**Double-Arm Mixer**

(148D) Under the name of the Superkneader Series, the H. W. North Co. is now making a line of double-arm type mixing and kneading machines for any class of service up to 3,000 gal. Heavy duty models include intensive type internal mixers for masticating and dispersing rubber stocks, resin paints, plastics, floor coverings and similar compositions. Lighter duty tiltable types incorporate advantages in lessened floor space and greater working capacity. These machines feature also a lower charging level, combined with an unlimited choice of loading positions. All employ ASME Code welded construction and a wide choice of materials suitable to the process.—The H. W. North Co., Erie, Pa.



MULTI-FUEL OPERATION:  
**Steam Generator**

(148E) Model C300 is the designation of a new addition to the line of automatic package-type steam generators manufactured by Cyclotherm Corp. This boiler, available in pressures from 15 to 200 psi., is designed to fire light oil, heavy oil, gas or a combination of gas and oil. As supplied, the unit is fully assembled, piped, wired and test fired for performance prior to shipment. Installation requires only connections for water, steam, fuel and electricity. Although a stack is not needed for proper functioning, one may be required by local regulations.—Cyclotherm Corp., Oswego, N. Y.

LEAVES TUBING UNBAMAGED:  
**Tubing Union**

(148F) Steel Products Corp. is offering the new Sta-Union, a threadless union for joining stainless steel tubing. The union consists of a stainless steel body threaded at either end, (Continued)



CREATIVE  
DRYING  
ENGINEERING

**New LOUISVILLE DRYER adds 12,000 lb. to daily production... saves 88¢ per 100 lb. it dries!**

KNOW THE  
RESULTS  
before you buy!

#### FORMER DRYER

Installed cost.....	\$64,000
Daily production (dry product, lb.)	8,000
Space occupied (sq. ft.).....	780
Drying cost per 100 lb.....	\$1.442

#### LOUISVILLE DRYER

Installed cost.....	\$86,400
Daily production (dry product, lb.)	20,000
Space occupied (sq. ft.).....	480
Drying cost per 100 lb.....	\$3.535

#### NEW INSTALLATION

#### PAYS FOR ITSELF IN 491

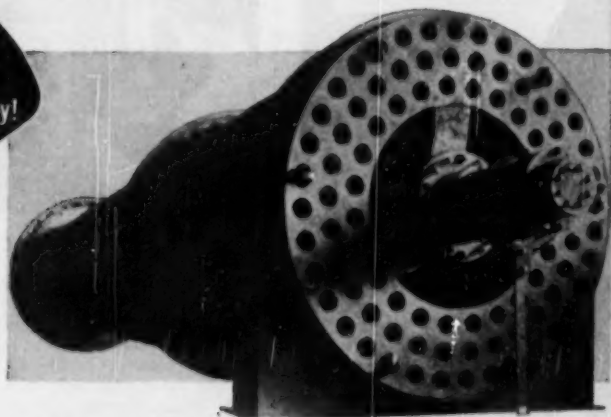
#### DAYS OF CONTINUOUS

#### OPERATION

Ask for new treatise on subject of rotary dryers

#### Other General American Equipment:

Turbo-Mixers, Evaporators, Thickeners,  
Dewaterers, Towers, Tanks,  
Bins, Filters, Kilns, Pressure Vessels



Compare the facts and figures shown at the left. More persuasively than anything else that could be said, they tell you why this chemical company decided on a new Louisville Dryer. It was especially designed for this manufacturer after a Louisville engineer surveyed his drying processes. Savings—added production and extra protection from contamination were forecast by tests of the new equipment in our unique research laboratories and pilot plant—proof that it pays to know the results before you buy!

It costs you nothing to have a Louisville engineer survey your drying methods. Write today.

#### Louisville Drying Machinery Unit

Over 50 years of creative drying engineering

#### GENERAL AMERICAN TRANSPORTATION CORPORATION

Dryer Sales Office: Hoffman Bldg., 179 So. Fourth Street  
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Floors, Equipment  
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**DARNELL Casters  
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these low-cost  
floor protection  
products have  
been made to give  
you a long life of  
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free service.

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LONG BEACH 4, CALIFORNIA

60 WALKER ST. NEW YORK 11 N.Y.  
36 N. CLINTON CHICAGO 6, ILL.

#### NEW EQUIPMENT, CONT.

with mild steel grip nuts screwed on each end. Within each end is a plastic gasket. To join two lengths of pipe, the grip nuts are backed off part way, the two pipe ends (with burrs removed) are shoved in either end of the union until the ends butt, and then the grip nuts are simply screwed up against the gaskets, forming a joint which is said to be both strong and tight, and to leave the tubing undamaged for future disassembly. The gaskets used are said to resist attack of virtually all materials except molten alkali metals, at temperatures up to 400 deg. F. Available sizes range from  $\frac{1}{4}$  to 24 in. outside tubing diameter. — Steel Products Corp., 52 Vanderbilt Ave., New York 17, N. Y.

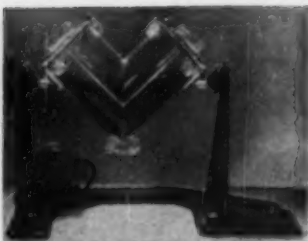


SMALLER, SIMPLER:

#### Electron Microscope

(150A) To permit the application of the electron microscope throughout a much wider cross section of industry and research than at present, RCA has brought out a simplified 30-in. table model which, together with its accessories, is said to cost about one-third as much as the company's large Universal model. Development of an instrument of this small size was made possible largely by the development of a new permanent-magnet lens system instead of the conventional electromagnet and electrostatic lenses. In addition, the new instrument has benefited from the development of improved vacuum equipment and synthetic rubbers, and the introduction of new means for aligning optical components and introducing specimens and photographic plates into the vacuum enclosure.

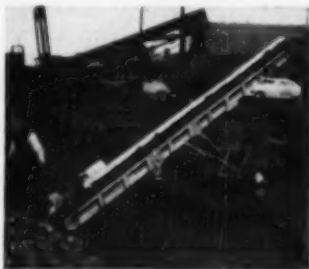
Retaining the same 50 kv. accelerating potential used in the larger model, the new instrument is capable of magnifying up to 6,000 times, producing photographs which can be enlarged up to 50,000 x. This compares with an overall enlargement possible with the large model of 160,000



#### TRANSPARENT BLENDER

(150B) Patterson-Kelley, having introduced its plant size Twin-Shell blender at the recent Chemical Show (*Chem. Eng.*, page 142, Feb. 1950), has now developed a small transparent model in 4 and 8 qt. sizes for laboratory and pilot plant use. Both sizes of container use the same frame, and extra blender shells are available for use where danger of contamination exists. The unit comes complete with adjustable cast aluminum base and 1/20-hp. gearhead motor. —The Patterson-Kelley Co., 11 Burson St., East Stroudsburg, Pa.

x. The new instrument has been simplified in so many respects that it can be operated even by a high school student with no more than about 1 hour's instruction. In addition to the instrument proper, operation requires the control panel shown in the accompanying view, together with a two-stage vacuum pump and a power supply unit which provides the necessary filament current and high accelerating potential. Both specimens and photographic plates are introduced through air locks, introduction of a specimen requiring only 6 sec. to restore the necessary high vacuum, and introduction of a plate requiring only 90 sec. to restore the necessary vacuum. —RCA Victor Division, Radio Corp. of America, Camden, N. J.



LIGHT, PORTABLE

#### Truck Loader

(150C) Portability, light weight and aluminum construction are featured in the new Truck-Phil offered  
(Continued)

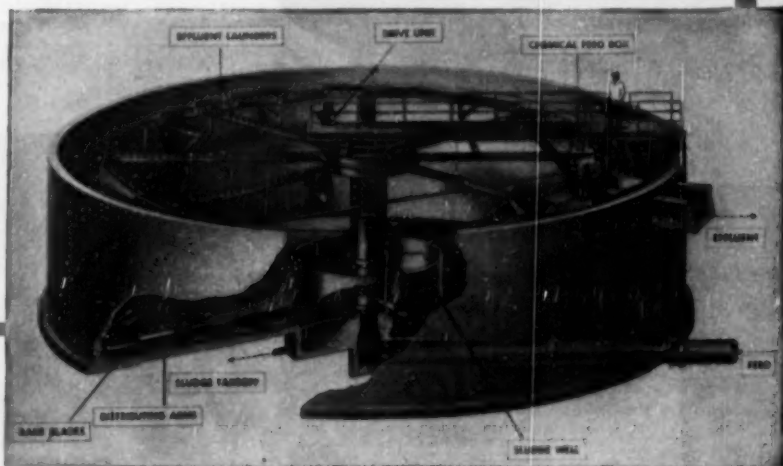
# LET'S LOOK AT THE FACTS

when selecting HIGH-RATE units for industrial water treatment!

You want the best . . . when you select high-rate units for the removal of hardness, turbidity, color or algae from your process water.

Here are six basic reasons why you should select Dorco Hydro-Treaters . . . for the best results . . . at lower cost:

- ✓ Uniform, low turbidity effluent
- ✓ Positive, continuous sludge removal
- ✓ No "slug loading" on adjacent streams
- ✓ Exceptionally low moisture content in discharged sludge
- ✓ Low installed cost
- ✓ Minimum power requirements



THE DORCO HYDRO-TREATER  
Overflow launder arrangement illustrated used on larger sizes. Arrangement varies with size of unit.

If you are investigating high-rate, up-flow type units for industrial water treatment, get all the facts before deciding. A Dorr engineer will gladly supply detailed figures and operating results . . . at no obligation.

# DORR

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**DORCO**

**THE DORR COMPANY, ENGINEERS**  
BABY PLACE, STAMFORD, CONN.

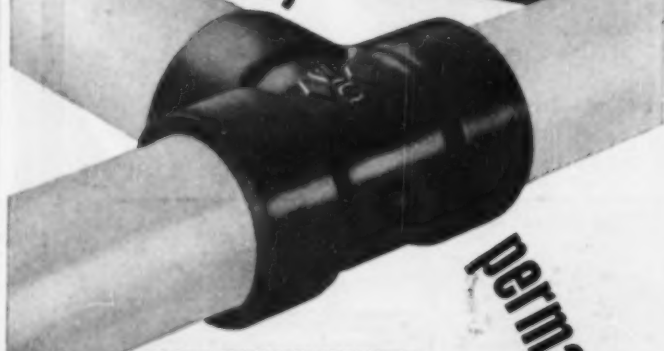
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**IN THE CHEMICAL INDUSTRY,** the right answer to every pressure, temperature, and acid resistance Fittings Problem is W-S Screw End and Socket Weld Forged Steel Fittings.

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Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

9-K-17

NEW EQUIPMENT, cont. . .

by the Phillips Conveyor Co. Only one man is required to handle the unit which is of airplane-type aluminum construction. Capacity, however, is sufficient to fill a truck with lump material within a few minutes. The loader is produced in three lengths of 164, 18 and 194 ft. Since it has a solid apron under the belt, it is said to be able to load any kind of bulk material.—Phillips Conveyor Co., Memphis, Mo.



INDEPENDENT OF COLOR:

#### Recording Turbidimeter

(152A) Using three photovoltaic cells, a new recording turbidimeter developed by the Special Products Division of GE operates on the ratio of

(Continued)



#### COMPACT STAINLESS FILTER

(152B) Carrying further its diaphragm type of porous stainless steel filter, Micro Metallic has developed a type known as the Surfamex which is available in six pore openings ranging from 5 to 165 microns, for pipe size connections from 1/4 to 2 in. On special order units up to 10 in. pipe size, in capacities to 10,000 gpm., can be produced. The accordion-type construction is clearly indicated in the view above.—Micro Metallic Corp., 193 Bradford St., Brooklyn 7, N. Y.

# Transit Type *ES* Pumps

## FOR CHEMICAL, PROCESSING AND GENERAL SERVICES

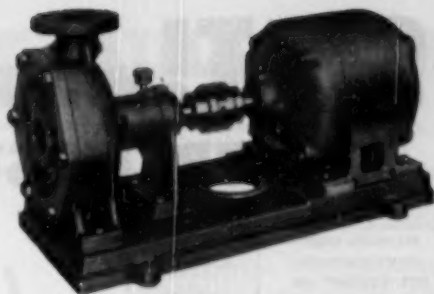
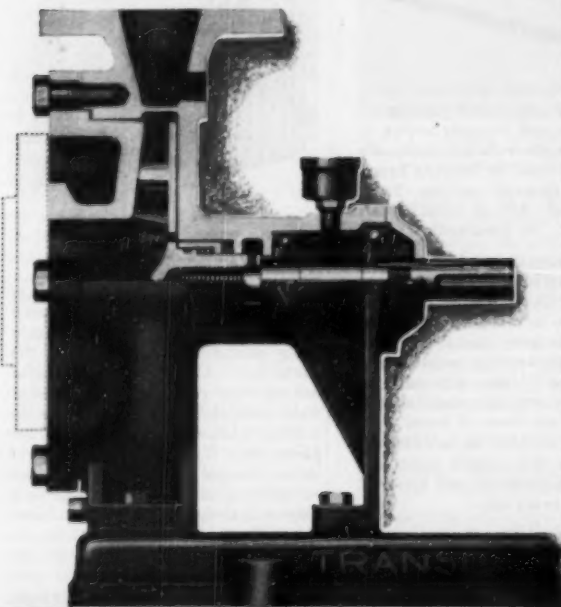
Max. working pressure 200 ppsi, 200 °F.,  
150 lb. Flange Drilling.

Capacities up to 550 G P M, differential  
heads to 160'.

Designed to give maximum strength, de-  
pendability, efficiency, and simplicity at  
minimum cost.

Ask for Bulletin 6100.

For Higher Pressures, Capacities and  
Temperatures, ask for Bulletin 6000,  
Transit Type ES.



### COMPARE THESE FEATURES

- 1 A balanced mechanical seal which can be repaired from impeller end without making any precision measurement and without disturbing the shaft, bearings, coupling, driver, or discharge piping.
- 2 Supported directly under the case for maximum strength and freedom from piping strains.
- 3 Case and bearing bracket are one integral casting of the same metal for maximum strength, true alignment and 100% corrosion protection.
- 4 No threads, and minimum number of parts exposed to the line fluid. All parts can be furnished in any metal or alloy which can be cast and machined.
- 5 Totally enclosed stainless steel clad case gasket which can be reused many times.
- 6 Extra heavy cases and impellers for liberal corrosion and erosion allowances.
- 7 The least number of parts per pump and the maximum interchangeability of parts between sizes. Six sizes with all parts interchangeable except case, end cover and impeller.
- 8 Extra heavy shaft and bearings with running clearance easily adjusted for maximum efficiency.
- 9 Discharge nozzle is vertical and is located at center of pump for venting and to simplify piping.
- 10 Minimum floor space required.

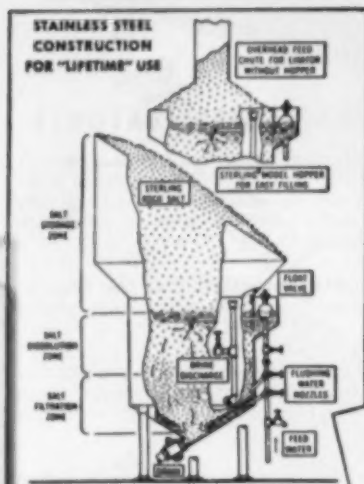
## NATIONAL TRANSIT PUMP AND MACHINE CO.

Home Office and Works, OIL CITY, PENNA.

CHICAGO, 624 South Michigan Ave. • CLEVELAND, 702 Marshall Building • HOUSTON, Room 522 West Building  
SAN FRANCISCO, 607 Market St. • NEW YORK, 30 Rockefeller Plaza • PHILADELPHIA, 2324 Fidelity Phila. Trust Bldg.  
PITTSBURGH, 912 Farmers Bank Building • TULSA, 318 East Archer • LOS ANGELES, 2068 East 12th Street



# SALT! WHY HAUL IT? MEASURE IT? STIR IT?



*Just Turn  
It On!*



**STERLING ROCK SALT  
BRINE DELIVERED BY PIPE  
TO EVERY POINT OF USE  
IN YOUR PLANT—**

## HOW LIXATOR WORKS

In the dissolution zone—flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. In the filtration zone—through use of the self-filtration principle originated by International, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

## WHAT THE LIXATOR PROVIDES

- ✓ Chemical and bacterial purity to meet the most exacting standards for brine.
- ✓ Unvarying salt content of 2.65 pounds per gallon of brine.
- ✓ Crystal-clear brine.
- ✓ Continuous supply of brine.
- ✓ Automatic salt and water feed to Lixator.
- ✓ Inexpensive, rapid distribution of brine to points of use by pump and piping.

Savings up to 30% and often more in the cost and handling of salt have been reported by many Lixator users. Why not investigate?

• You can eliminate shoveling, hauling, and laborious hand stirring of salt and water, and frequent testing of the brine strength—with International's new Lixate Process for Making Brine. Stops waste through spilling. Saves time and labor. Assures accurate salt measurement...no guesswork.

• In the production of chemicals, leather, textiles, plastics, soap, sulphonated oils, petroleum products, food products, in refrigerating equipment such as spray decks and unit coolers, in regenerating zeolite water softeners, the Lixator provides an extremely easy way of measuring salt accurately in the form of brine. YOU SIMPLY TURN A VALVE for self-filtered, LIXATE Brine that ideally meets the most exacting chemical and bacterial standards for every use.

AN INTERNATIONAL Exclusive

*The* **LIXATE** *Process*

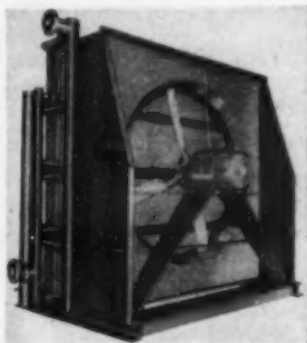
FOR MAKING BRINE

\*REG. U. S. PAT. OFF.

INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.

## NEW EQUIPMENT, CONT.

scattered light to transmitted light as a measure of turbidity, thus making measurements independent of color of the liquid under test, and light and voltage variations. The equipment consists of a cast bronze sampling chamber mounted at the process and a strip or circular chart recorder which may be at a remote location. The sampling chamber houses three hermetically sealed cells, one measuring transmitted light and two measuring scattered light. The light source is a 100-watt projection lamp, operated at reduced voltage for longer life. The instrument can be furnished pre-calibrated or left uncalibrated for those who wish to calibrate their own instrument to agree with previous records. Calibration is facilitated by two adjustments, a zero-setting and a range setting.—Special Products Division, General Electric Co., Schenectady 5, N. Y.



## NEEDS NO WATER: Dry-Type Cooler

(154A) Of increasing interest as cooling water becomes scarcer in some areas, dry-type fluid coolers are now being produced in 22 sizes by the Trane Co. These coolers are useful not only for air-cooling engine jacket water and lubricating oils, but also for a wide variety of chemical-cooling applications. Each cooler consists of three principal parts, the cooling core or extended surface heat transfer coil, a specially designed propeller fan blowing a large volume of cooling air across the coils, and a heavy duty casing built to withstand wind and weather. Using simple combinations of coil circuits, one standard unit can dissipate the heat from two or three different fluids at different entering and leaving temperatures and different quantities of liquid. The 22 standardized units in the line range from cool-

(Continued)

# COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared by Bridgeport Brass Company

Bridgeport

Headquarters for BRASS, BRONZE, and COPPER

## Effect of Water Velocity on Condenser Tube Life

Does the water velocity affect the corrosion rate of condenser and heat exchange tubing? Experience has shown that water velocity is a very important factor, but there are many other contributing elements which must be taken into account, such as the temperature, fouling organisms and the character of the water—degree of salinity, pH value, amount of gases such as oxygen, hydrogen sulfide, carbon dioxide and others; concentration of foreign matter such as sand, cinders, shells, oil. The corrosion resistance of the condenser tube alloy itself also plays a very important part.

### Effect of High Water Velocities

Increased water velocities and turbulence may result in impingement corrosion failure which is brought about by the impact of the water on the metal surface. This type of attack is generally recognized by the presence of almond or crescent shaped pits, undercut at one end, and usually free from corrosion products in the pits themselves.

Continued impingement of the stream against the tube in one spot leads to the removal of normal corrosion film until the base metal is exposed which then corrodes at a much higher rate than normal.

### Impingement Corrosion Destructive

Impingement corrosion is most commonly found at the point of impact which is generally near the inlet end of the tubes where turbulence is present due to the restriction and speed-up of the water stream as it enters the tubes from the water box. Pieces of shells, stones, coke and other foreign matter lodged in condenser tubes may cause the water to be deflected against the opposite side of the tube, resulting in impingement corrosion at that point.

The presence of sand and entrained

gases leads to increased attack. Water carrying sand or silt, in the absence of direct impingement may produce a scouring or abrasive action which may in time seriously reduce the wall thickness of the tubes.

Entrained bubbles of gas greatly increase the rate of impingement. This

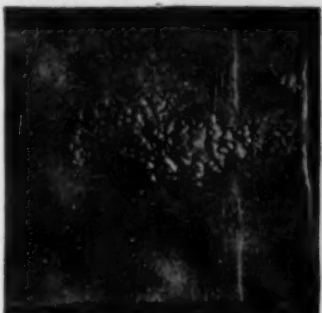


Figure 1. Illustrating impingement corrosion at inlet end of Admiralty condenser tube. Tube has been split lengthwise and flattened.

is aggravated in sea water by the presence of hydrogen sulfide resulting from bacterial action on organic material. Impingement corrosion can be reduced by removing entrained gases from corrosive water by various devices used for this purpose.

Obviously, whatever can be done to remove these disturbing influences will lengthen tube life. It is desirable to keep intake tunnels clean and use fine

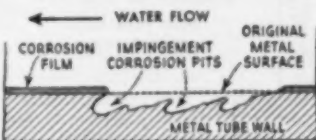


Figure 2. Section through wall of tube shows how impingement of stream removes corrosion film and corrodes base metal to form crescent-shaped pits.

screens to prevent shells and debris from entering the tubes.

### Effect of Too Low Water Velocities

Water velocity which is too low, may be troublesome because it permits the attachment of slime, marine growth, barnacles, mussels and other foreign matter to attach themselves to the tube wall. Once this condition is established, higher velocities cannot readily remove them. However, high water velocities usually prevent larger marine organisms from obtaining a foothold.

Slime is undesirable because it cuts down heat transfer, bringing about a drop in vacuum which may waste fuel.

Low water velocities encourage the settling of sand, clay and other foreign materials on the tube surface and contribute to damage from pitting. It may be necessary to use settling basins, screens or strainers in order to eliminate debris from the water before it reaches the condenser. Speeding up the water may prevent settling in the tubes but opens up the possibility of encouraging impingement corrosion at the inlet ends of the tubes.

Steps used to keep tubing free from slime and other foreign attachments include periodical chlorination, cleaning with rubber plugs, brushes, high pressure water jets or other methods.

### Influence of Condenser Tube Alloys

Experiments over a long period of time indicate that alloys vary considerably in their resistance to impingement corrosion. Aluminum brass is superior to Admiralty tubing in resisting this type of attack. Cupro Nickel has proven to be excellent in resistance to corrosion from sea water flowing at high velocities. Duralumin IV, Arsenical aluminum bronze is giving a fine account of itself in resisting this type of attack.

Bridgeport maintains an active corrosion research laboratory for studying the behavior of copper-base alloys in corrosive environment. Call on our nearest district office for further information on condenser and heat exchange tubing.

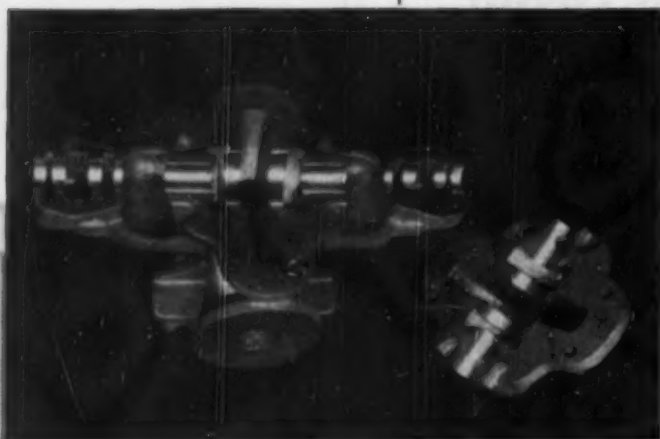
## BRIDGEPORT BRASS

BRIDGEPORT BRASS COMPANY, BRIDGEPORT 2, CONN. • ESTABLISHED 1865

Mills at Bridgeport, Connecticut, and Indianapolis, Indiana • In Canada: Harnden Copper and Brass Limited, Montreal

# CORROSION... *Checkmated!*

## WITH LEBANON STAINLESS CASTINGS



**M**ETALLURGISTS AND PRODUCTION MEN are pointing the way to corrosion control by the use of stainless alloys. These alloys range from the general purpose (19-9) to the highly specialized types, each particularly suited to service requirements. Lebanon Circle ① 22 (analysis at right) is a typical example of a stainless alloy that adds years of usefulness to any casting that must withstand corrosive attack.

Lebanon laboratory and production techniques play an important part in maintaining the high quality of our castings. Modern electric induction furnaces provide maximum flexibility of control so valuable in processing alloy material.

Our engineers are at your service, anxious always to help you solve your problems by developing entirely satisfactory castings.

If you do not have copies of our Data Sheets we will be glad to send them on to you.

LEBANON STEEL FOUNDRY • LEBANON, PA.  
"In the Lebanon Valley"

Field-machined casting of a Centrifugal Pump Casing made of Lebanon of Circle ① 22 Stainless Steel.

### LEBANON CIRCLE ① 22

#### NOMINAL ANALYSIS

Carbon Max.	0.08
Silicon	1.25
Manganese	0.75
Chromium	19.50
Nickel	9.00

#### NOMINAL

#### PHYSICAL PROPERTIES

Tensile Strength	75,000
Yield Point	36,000
Elongation in 2" — %	50
Brinell Hardness	135

#### HEAT TREATMENT:

Water Quenched

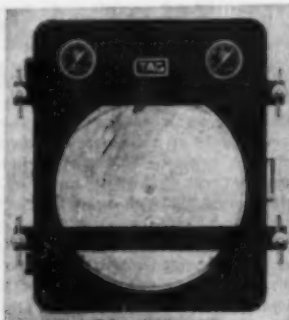
**LEBANON**  
ALLOY AND STEEL

*Castings*



### NEW EQUIPMENT, cont. . .

ing capacities of 66,250 to 7,630,000 Btu. per hour. The smallest unit of the line uses an 18-in., 1-hp. fan for 20 gpm., while the largest uses a 34-hp. fan and handles 1,000 gpm. of water. — The Trane Co., LaCrosse, Wis.



### OPERATES AUTOMATICALLY:

### Humidity Controller

(156A) The latest addition to the Tagliabue line of instruments produced by Weston is a humidity controller operating on the wet-and-dry-bulb principle. The controller automatically regulates the wet-bulb depression for which it is set, regardless of fluctuations in dry-bulb temperature. One pen records dry-bulb temperature and the other wet-bulb depression. The humidifying agent is regulated automatically by control of a valve operated by the instrument. For operations where a gas-tight instrument is desired, bars can be clamped on the case of the instrument as illustrated.—Weston Electrical Instrument Corp., 614 Fielingshuysen Ave., Newark 5, N. J.



### ECONOMICAL, EFFICIENT:

### Speed Changer

(156B) For speed-change ratios up to 2 to 1 and power in the range from 1½ to 40 hp. (at motor speeds from 900 to 1,800 rpm.) Allis-Chalmers is offering a new design of continuous (Continued)

ship  
corrosive liquids  
in tin?

yes! safer... better... cheaper  
in containers lined with  
**VISQUEEN** film!

Now General Electric  
cuts shipping costs by as  
much as one-third.  
Each quart makes a  
gallon of X-Ray chemicals.



Liquid corrosives have always called for glass shipping containers. But glass breaks. Containers are bulky, heavy—costly to ship.

Metal cans, pails or drums wouldn't work with these "hot" liquids—until they hit on the idea of lining the containers with tough, chemically inert VISQUEEN film. "They", in this case, were Edwal Laboratories, General Electric X-Ray Corporation, and The Visking Corporation. The products:—photographic and X-Ray chemicals.

Assisting at the birth of the revolutionary new package were the Traver Corp., fabricator of the VISQUEEN film bags; and the Crown Can Co., source of the cans and sealing equipment.

Results? The new packaging cuts 33 1/3% off the weight of each unit. Saves 25% in package size. And saves up to 35% in shipping costs. Being unbreakable, the new package can be shipped by low-cost parcel post.

This new method of shipping may save your firm thousands of dollars. Get all the facts now!

From 4 oz. to 55 gallons! That's the size range of VISQUEEN film-lined containers used by the Edwal Laboratories, Ringwood, Ill., for their special X-Ray super-fast developer.

VISQUEEN® FILM A PRODUCT OF

**VISKING**

THE CORPORATION

PRESTON DIVISION • TERRE HAUTE, INDIANA

\*T. M. The Visking Corporation

The Visking Corporation

Preston Division, Box

Terre Haute, Ind.

Send us more detailed information on new method of shipping liquid corrosives.

Name.....

Company.....

Title.....

Address.....

City..... Zone..... State.....

MAIL COUPON FOR FACTS

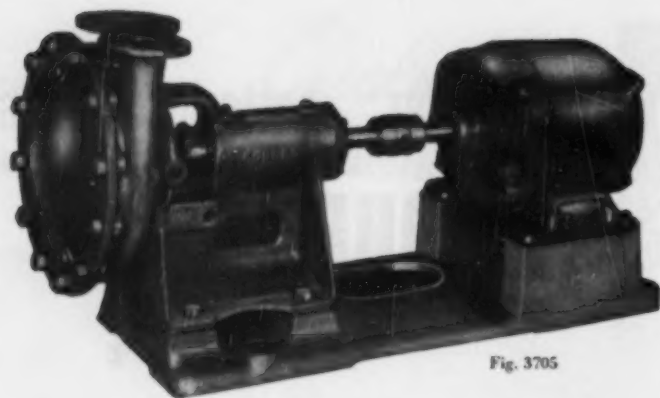


Fig. 3705

## For Outstanding Service Handling Corrosive Liquids— Goulds new stainless steel centrifugals

### ADVANCED PUMP DESIGN—

The Goulds 3705 stainless line represents the last word in effective design. Fig. 3705 pumps will give you efficient, dependable, 24-hour service in handling corrosive liquids—at low cost.

### CAPACITIES—

Goulds stainless steel centrifugals are made in 8 sizes with capacities to 750 G.P.M. and heads to 180 ft. depending upon capacity.

### ADVANTAGES—

Exceptional efficiency (see Bulletin for performance curves) plus extreme simplicity make this an ideal pump for corrosive applications. High interchangeability of parts cuts stocking problem. Quick inspection or cleaning—simply remove casing cover without disturbing pipe connections.



Write for Bulletin 725.3 for complete details  
on this new stainless steel pump.



### NEW EQUIPMENT, CONT. . .

ously variable speed-change unit. The combination consists of a new type of Vari-Pitch automatic sheave, a companion sheave, the necessary V-belts and a Texslide motor base. Speed changes of the driven machine are obtained simply by turning the adjusting screw on the motor base with any commercial wrench. This automatically changes the pitch diameter of the driving sheave as desired. An automatic belt tension stabilizer provides the proper side-wall pressure and belt tension regardless of the position of the belts in the grooves. The drive is said to be particularly applicable to high starting torque since it permits the belts to ride at smaller pitch diameters during acceleration. The new arrangement is said to be particularly suitable for driving mixers and agitators as in the chemical plant application illustrated here.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

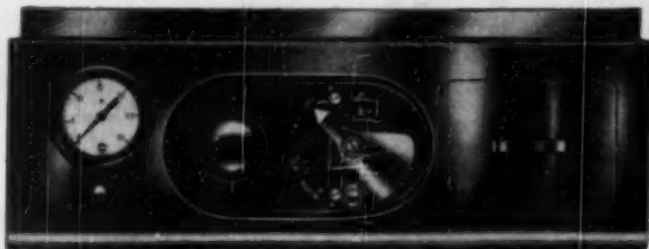


### GIVES THROTTLING CONTROL: Current Controller

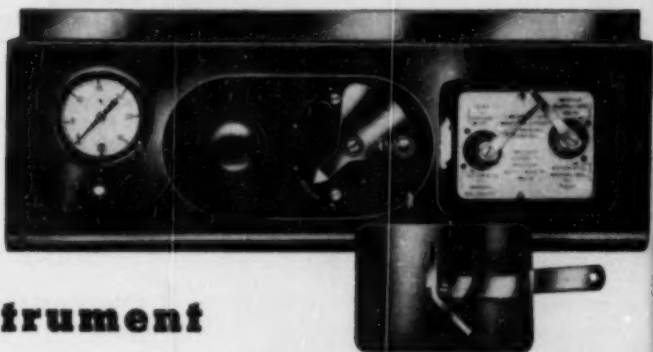
(158A) To give improved throttling control of electric current from pneumatic controllers, Conoflow Corp. has developed a new current controller, Model EB, which utilizes the company's new pneumatic cylinder operator in conjunction with a standard electrical component modified for continuous throttling control service. The latter is commonly a small rheostat-potentiometer for controlling the input to electronic speed control devices such as the GE Thymotrol or the Westinghouse Mototrol; or an electric device such as the General Radio Variac or the Superior Electric Powerstat. The arrangement is such that it permits the electrical device to be turned through 290-310 deg. of rotation, thus improving materially on limited-stroke devices commonly used in the past which required cumbersome mechanical linkages or multi-

(Continued)





# No other control instrument



has an external manual-automatic station

**as mistake-proof as this**

**EXCLUSIVE** mechanical interlock prevents switching into wrong position

**EXCLUSIVE** "balancing" arrangement prevents "bumping" on changeover

Among the many features which have put the Bristol Series 500 Air-Operated Controller way out front is the unique External Manual-Automatic Station.

1. "Test" and "Service" positions are mechanically interlocked. Operator cannot, by mistake, go through "Manual" position into either "Test" or "Service."

2. Output pressures of the controller and the regulator on panel are measured by the same gauge. This enables operator to achieve exact balance before going from automatic to manual control or vice versa, thus eliminating the possibility of a "bump" to the process during changeover.

Bristol's External Manual-Automatic Station is an integral part of the controller installation

... yet can be used independently for manually controlling the process *before* the controller is installed or *after* it has been removed for any reason.

Read what else Bristol Series 500 Controller gives you . . . calibrated control, single service adjustment, reset stops, etc. Write for new Bulletin A120 on Series 500 Air-Operated Controllers, THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 20, Conn.



## BRISTOL

Engineers process control for  
better products and profits

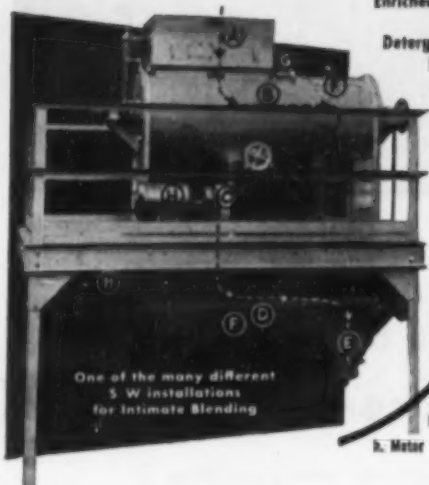
**AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS**

LOOK WHAT'S

NEW IN

# intimate blending

for Agricultural Dusts  
Brake Lining  
Battery case formulas  
Dry plastering blends  
Enriched feed blends • Ceramics  
Plastic formulations  
Detergents • Dyes • Pigments  
Kalsomine and Pigments  
and many other  
fine powder blends



One of the many different  
S/W installations  
for intimate blending

- a. Protective Brush Sifter
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- c. High Speed Blending Mill
- d. Conditioning-Reservoir
- e. Dust-Tight Packaging Valve
- f. Rapid Access Panels
- g. Safety Vent Collars
- h. Motor

When specifications call for powder blends of high uniformity, Sprout-Waldron's *Intimate Blending Systems* provide the perfect solution. Engineered to individual needs, these versatile systems are indicated wherever powders 100 mesh or finer are to be blended to smooth-flowing, lump-free uniformity—especially formulas including liquids or fibers as well.

Ruggedly constructed, the compact assemblies operate on the gravity flow principle and take up a minimum of floor space. They are misers on power consumption, too—are quiet, smooth-running, and clean. Dust-free operation is another vitally important S/W feature.

Easy accessibility and simplicity of interior for cleaning, etc., assure advantages which have been developed through long practical experience. The minimum of moving parts means additional economies in maintenance.

Sprout-Waldron specialists have successfully solved intimate blending problems in a great many widely different processing plants from coast to coast. Their expert advice is yours for the asking. It may help step up production, improve your product and working conditions in the plant, and increase profits.

Write for Bulletin I-846 today! Address Sprout, Waldron & Co., Inc., 15 Waldron Street, Muncy, Penna.

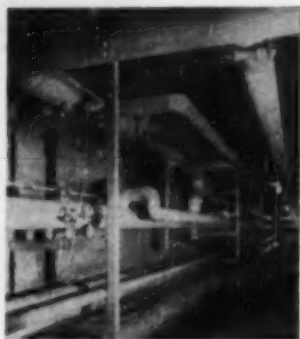
**Sprout-Waldron**

*Manufacturing Engineers*

MUNCY • PENNSYLVANIA

NEW EQUIPMENT, CONT.

plying gears. The new cylinder operator is said to overcome these difficulties, providing accuracy and sensitivity of positioning within 1/500th part of its total travel. — Conoflow Corp., 2100 Arch St., Philadelphia 3, Pa.



SIMPLIFIES INSTALLATION:

## Pipe Support System

(160A) The relatively new Unistrut system of framing has recently been adapted to the task of support heavy piping runs. The view shows a large tunnel installation at the plant of C. D. Searle & Co., Skokie, Ill., manufacturers of ethical pharmaceuticals. Here the pipes are supported on framing made from basic Unistrut steel channels and fittings, assembled on the job to Unistrut continuous concrete inserts embedded in the ceiling and walls and bolted to the floors. Unistrut roller pipe supports fitted to the horizontal

(Continued)



## FAST WELDING FOR ALUMINUM

(160B) Linde is offering the new FSM-1 Helarc welding machine for the argon shielded metallic arc welding of aluminum. The process is applicable to either machine or hand welding, requiring no flux and producing clean, smooth welds of high quality, it is claimed, at a high rate of speed. Almost any thickness can be welded by a suitable number of passes.—The Linde Air Products Co., 30 East 42d St., New York 17, N. Y.

# Corrosion Limited

**ESCO**

STAINLESS 45

14 IN

No 353

**T**he symbol "ESCO 45" or "ESCO 20" cast on the corrosive handling equipment in your plant means that you will not pay the heavy cost of uncontrolled corrosion, nor suffer the loss of productive capacity which corrosion causes.

These ESCO stainless steels stop such losses before they start.

ESCO alloys 45 and 20 have proved to be exceptionally effective in chemical plant installations. Alloy 45 is an improved type 317, and has been used for years to combat corrosive conditions in food and petroleum processing plants, and pulp mills as well as the chemical industry.

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Alloy 20 (Duriron license) is a newer but thoroughly proved stainless steel that has been outstandingly successful in applications involving particularly vicious corrosion.

For certain conditions, other stainless alloys may be more effective. If a special analysis is required, ESCO is prepared to supply it in equipment that combines thorough engineering with closely controlled metallurgy and manufacturing processes.

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For Demineralized or Distilled Water. Indicates purity of water on scale calibrated 0 to 15 p.p.m. as NaCl impurities. Complete with cord and plug. Electric eye indicates correct setting. Bulletin 119 gives complete information.



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STILL & STERILIZER CO.

4 Lansville Terrace, Forest Hills, Boston 31, Mass.

## NEW EQUIPMENT, cont. . .

framing members carry the piping. The structure used is completely flexible, permitting variations in pitch or slope merely by loosening bolts which clamp the framing members together. Detailing is simplified, and installation requires neither drilling nor welding. —Unistrut Products Co., 1013 West Washington St., Chicago 7, Ill.



## SELF-CLEANING:

### Dust Collector

(162A) A new automatic dust collector of the tubular, blow-back type, produced under the Hersey patents, has been introduced under the name of Series 18 Acrotum by Turner & Haws. The collector uses tubular elements of hard-pressed wool felt as the filtering medium. A reverse-air-jet mechanism, which operates automatically, moves up and down continuously outside the tubes, dislodging dust collected on the inside and thus keeping the filtering medium operating at top efficiency at all times. These units are available in sizes from 2 to 16 bags, with bags up to 20 ft. high. Collection efficiency is said to be virtually 100 percent. The filtering rate depends on particle size. Typically, a rate of about 21 cfm. per sq. ft. of filter area is obtained on 10 micron dust particles.—Turner & Haws Engineering Co., 87 Gardner St., West Roxbury 32, Mass.

### Abrasion Tester

(162B) Taber has further developed the Taber Abraser for abrasion testing of materials, with the development of the new model 140. The action is the same as that of earlier machines but the new instrument features sturdier construction and greater versatility. Three standard ranges of wheel pressure are available.—Taber Instrument Corp., 105 Goundry St., North Tonawanda, N. Y.

(Continued)

The filter cake will not slip or crack on

# SPARKLER HORIZONTAL FILTER PLATES



The horizontal position of the cake resting on the plates in a Sparkler Filter eliminates all possibility of slipping or cracking and assures uniform even filtration with any type of filter media used. Variations in temperature, pressures, or intermittent service will not disturb the stability of the cake.

Filter media is floated onto the horizontal plates, flow is always with gravity, and deposited in a cake of even uniform thickness built up without stress. With Sparkler horizontal plates any media, filter paper, cloth, or screens can be used with maximum efficiency.

Our engineers are ready to help solve your filter problems. Write giving details.



200 sq. ft. of filtering surface in a horizontal plate assembly ready for a quick change of plates in a Sparkler Filter. Complete change of plates takes but a few minutes with a minimum of interruption in service.



Stainless steel Sparkler filter commonly used in chemical plants.

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# STANDARD AIRE

## Precision Built Axial Flow

### BLOWERS

handle the movement of air gently by screw action instead of paddle action, as is the case with other positive displacement blowers. Result—air pulsations and noise are reduced to a surprisingly low level. In Standardaire Blowers the revolutionary new form of the rotors marks a major improvement in blower design. The rotors are produced by an exclusive rotary generating process, the form and helix being controlled entirely by the machine gears. This produces rotor threads that are accurately shaped and machined to close tolerances for efficient blower operation. The design of the rotors and other construction details makes possible internal compression to a degree that Standardaire Blowers operate on a modified adiabatic cycle with a lower mean internal pressure. This important feature, together with advanced engineering throughout, makes for a quiet, compact, efficient blower with long service life.

Write for Standardaire Blower Bulletin covering dimensional information. Publication No. 88.

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Standardaire Blower equipped with unique pulley attachment for belt drive, when required.

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NEW EQUIPMENT, CONT.

### Gas-Charged Extinguisher

(164A) Developed with the idea of eventually replacing the conventional soda-acid extinguisher is a new stainless steel model employing water as the extinguishing agent and carbon dioxide in a pressure cartridge as the propellant. The new extinguisher eliminates all the bother of preparing and maintaining soda-acid extinguishers, and is also lighter and easier to operate. To discharge, it is only necessary to turn it upside down and strike it on the floor to release the carbon dioxide from the cartridge. —Pyrene Mfg. Co., 560 Belmont Ave., Newark 8, N. J.

### Electric Eye

(164B) Following development of its germanium Transistor, which replaces vacuum tubes in many applications, Bell Labs has developed the Phototransistor which also utilizes a tiny chip of germanium, but is controlled by light rather than by the electric current of an emitter. The device is no bigger than a 0.22 calibre rifle cartridge, but delivers very high power for a photoelectric device. It is still in the experimental stage.—Bell Telephone Laboratories, 463 West St., New York 14, N. Y.

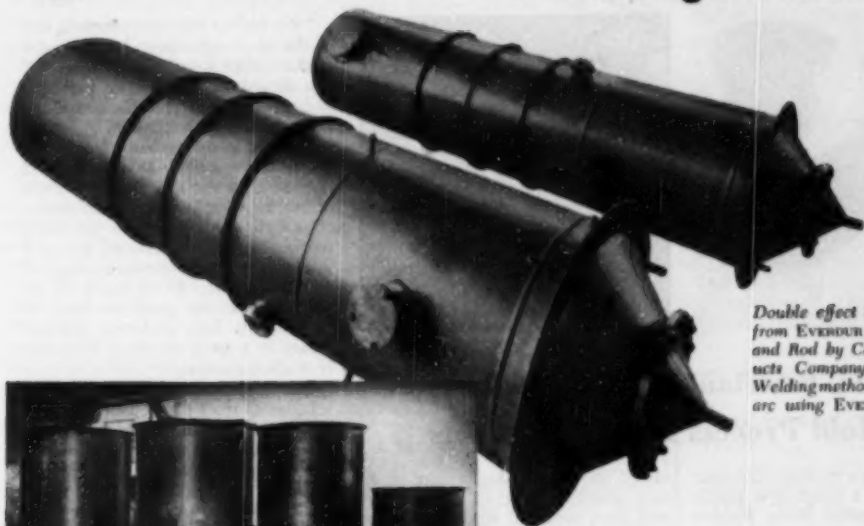
### Photochemical Lamps

(164C) Three new photochemical lamps recently announced by Westinghouse have been designed to emit a maximum of energy in wavelengths near 3,650 Angstrom units, making them suitable for applications in chlorination, bromination, hydrogenation, polymerization and other photochemical reactions. Type C-H9 is rated at 3 kw., Type A-H13 at 1,200 watts and Type A-H14 at 940 watts. The first and last are rated at 2,000 hr. life (at 5 or more hr. per start), and the second at 1,000 hr.—Westinghouse Lamp Div., Bloomfield, N. J.

### Plastic Pipe Coating

(164D) Bauer & Black's Polyken plastic tape is now available in the form of a wrapping for pipe for protection either above or below ground. This oriented polyethylene tape, coated on one side with a synthetic pressure-sensitive adhesive, is applied cold without use of solvents. It is said to afford protection indefinitely for field joints in coated pipe, as well as for complete covering of uncoated pipe.—Plastic Engineering & Sales Corp., P.O. Box 1037, Fort Worth, Tex. —End

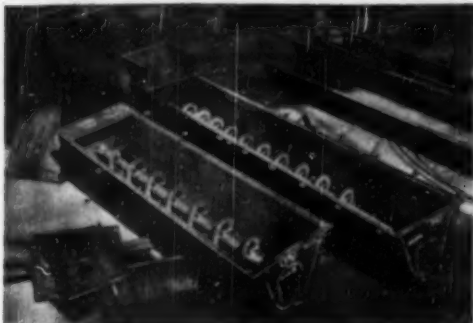
# Everdur<sup>®</sup> does a "sweet" job in this sugar refinery



*Double effect calandria fabricated from EVERDUR Plate, Circles, Pipe and Rod by California Steel Products Company, Richmond, Calif. Welding method: inert-gas-shielded-arc using EVERDUR Welding Rod.*



*Tanks for storing sugar syrup. Made of 1/4 in. EVERDUR Sheet. Removable covers are also EVERDUR. Built by Iron and Steel Contracting Co., San Francisco.*



*Screw mixer and conveyor made of EVERDUR Sheet, Pipe and Rod, inert-gas-shielded-arc welded using EVERDUR Welding Rod. Fabricated by McDonough Steel Products Co., Oakland, Calif.*

\*Reg. U. S. Pat. Off.

Sugar liquors are corrosive in certain stages of processing. And it is extremely important that there be no contamination from contact with metals.

Naturally, therefore, EVERDUR<sup>®</sup> is widely used in sugar refining equipment. Strong, tough, non-rusting, resistant to corrosion, and easily shaped and welded by standard methods and equipment, EVERDUR is a dependable, profitable material for a wide range of process industry equipment.

The equipment shown on this page was recently built for the Spreckels Sugar Company for installation in its large beet sugar refinery at Spreckels, Calif.

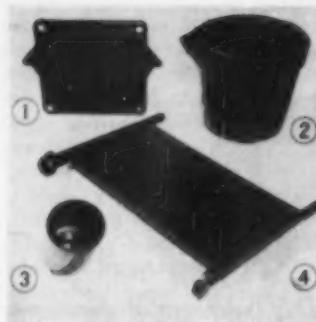
Our Technical Department has extensive data on specific applications of EVERDUR in many process plants. We shall be glad to discuss these in connection with your own process equipment problems. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.

**Where corrosion resistance counts — use Everdur**

**ANACONDA<sup>®</sup>**  
**COPPER-SILICON ALLOYS**

# New Products and Materials

JOSEPH A. O'CONNOR, News Editor



## New Plastic, Resistant to Chemicals, Used to Mold Process Equipment Parts

(166A) These molded articles are made of Enrup, a tough new plastic developed by United States Rubber Co. The filter press plate (1) and chemical bucket (2) are molded from Enrup instead of hard rubber because of the toughness, heat and chemical resistance of the new plastic. The lap roll (3) is used in the textile industry. Once it would have been made of laminated phenolic, but now it is molded of Enrup, cutting cost by 50 percent. It is also lighter in weight and stronger. The photostat separator plate (4), which formerly would have been made of hard rubber, is now made of Enrup because of its superior toughness. The covers for electroplating barrels, seen in the other picture, are molded in one piece from U. S. Rubber's new thermosetting plastic. Previous practice was to fabricate cover in sections from a thermoplastic material, then cement sections together. Molding has cut cost by more than 25 percent.

Bridging the gap that has existed between soft rubber and hard rubber for almost a century, the new plastic promises to become one of the basic raw materials of the rubber industry. It fulfills an urgent need for a high-strength material that is resistant to abrasion and chemicals and at the same time can be produced in varying degrees of flexibility ranging from elastic soft rubber on one hand and brittle hard rubber on the other.

While U. S. Rubber has not re-

vealed the exact composition of its new plastic, people in the industry who have seen and worked with the new material are reasonably certain that it is a blend of Buna-N and a phenolic resin, together with other modifiers.

One of its outstanding uses is for the manufacture of high-strength low-cost gears to replace metal gears in such applications as heavy-duty lathes, household appliances, plating barrels, automotive timing devices and dynamometers.

Gears made of the new plastic have been operating for more than a year in applications where conventional metal gears have failed within a few weeks. These gears were molded in one piece to very close tolerances that eliminated the need for elaborate finishing operations.

The plastic is particularly suited for washing machine parts where its resistance to the newer type of synthetic detergents has given it an advantage over metal.

Among the other promising applications for the plastic are: fuel pump parts, battery cases, dies and jigs, valve seats, buckets for carrying chemicals, plating barrels, filter press plates, photostat separator plates, tote boxes, bearings, electrical insulators, and various automotive parts such as camshaft timing gears, water pump impellers, ignition coil housings, distributor caps, low-load and low-speed bearings and bushings.

"We believe this new plastic is one of the most significant developments in the rubber industry since the war," says Ernest G. Brown, vice president and general manager of the company's mechanical goods division.

It has demonstrated remarkable toughness, resistance to abrasion and resistance to the deteriorating effects of oils, solvents, acids and mild alkalis. It is light in weight and extremely stable at high temperatures, having a safe operating temperature range of 180 to 250 deg. F. It has good arc resistance. It has good resistance to fire and its high dielectric strength makes it a good electrical insulator. It is thermosetting.

It has an impact strength that is superior to most plastic materials now being marketed and it can be molded economically in complicated shapes by either compression or transfer methods.

The new plastic is available in a wide range of hardnesses with a corresponding variation in other characteristics. Here are values for a typical compound:

Specific gravity	1.2
Tensile strength, psi	4,200
Hardness Rockwell M	55
Impact strength, ft.-lb./in. notch	1.3
Modulus of elasticity	180,000
Water Absorption, % gain 24 hr.	0.3
Dielectric strength, volts/mil.	500
Dielectric constant	9
Power factor	0.20

To be marketed under the trade name Enrup by U. S. Rubber's mechanical goods division, the new plastic is now being produced in two company plants located at Fort Wayne, Ind., and Passaic, N. J. Ample manufacturing capacity is available since it can be produced in standard rubber processing equipment. It is available in the form of sheets, rods, tubes, gear blanks and as molded parts.—United States Rubber Co., Rockefeller Center, New York 20, N. Y.

### FASTER CURING:

### Phenolic Plastics

(166B) A whole new class of phenolic plastics produced by Bakelite Division, Union Carbide & Carbon Corp., and designated as C-22 general-purpose phenolic molding materials will provide molders with production increases ranging from 45

percent to more than 100 percent. These new phenolics, with curing rates 15 to 45 percent faster than those of phenolics previously regarded as fast-curing, also offer high gloss and good mold release.

The valuable economic advantages provided by these new phenolics include increased output of molded parts, reduced cure time, reduced total cycle time, reduced mold costs, and fewer mold cavities required for a given rate of production.

Three such materials, all suitable for compression and plunger molding in positive or semi-positive molds, are currently available: BM-18750 Black, a general-purpose non-bleedproof molding material offered in the flow range 50-120; BM-18752 Brown, a general-purpose bleedproof brown material offered in the flow range 50-130; BM-18751 Black, a general-purpose bleedproof material offered in the flow range 50-130. To determine various flow ranges, flow was taken at 700 psi.—Union Carbide & Carbon Corp., Bakelite Division, 122 East 42nd St., New York 17, N. Y.

#### SUSPENSIOIDS:

##### **Polyamide Resins**

(167A) New, opaque white, water suspensions of General Mills polyamide resin have reached the pilot plant at General Mills Research Laboratories in Minneapolis. They are now available in semi-commercial quantities.

First introduced commercially by General Mills in 1947, the polyamide resins are formed by the condensation of dimerized vegetable oil acids with ethylene diamine. They are widely used as heat-sealing adhesives and as water-vapor resistant coatings for paper, plastic films and metal foils. Before the development of the new suspensoids, the polyamide resins were obtainable only for hot-melt or solvent application.

Dr. Harold Wittcoff, General Mills chemist who helped develop the firm's method of preparing the suspensoids, says the new products have distinct advantages over hot-melt or solution types of resin: although they are of medium viscosity, they contain a relatively high percentage of solids; they eliminate the need for using either expensive hot-melt equipment or inflammable solvents in their application; they make it possible to control the penetration of resin coatings into paper or other materials; and they are relatively free of odor.

The polyamide resin suspensoids are cationic. Remarkably stable, they

will not coagulate even when subjected to repeated freezing and thawing. They heat-seal and adhere firmly to a wide variety of materials, including fabrics, metals, paper, leather, plastic films and wood. Although their films are not continuous, they are highly solvent-resistant and, when fused, resistant to water, water vapor, grease and oil; they dry rapidly and do not block even under severe pressure. Despite their non-blocking properties, however, polyamide resin suspensoid films will heat-seal at reasonably low temperatures (90 to 100 deg. C.).

General Mills Research Laboratories are now making polyamide resin suspensoids of two grades: A-000, an essentially uncompounded suspensoid, and B-200, which is modified to produce improved low-temperature heat-seal bonds, superior resistance to abrasion and improved adhesive qualities.

Like polyamide resin itself, General Mills polyamide resin suspensoids are expected to find their largest-volume use as heat-sealing coatings for paper and plastic films. They also show promise as adhesive bonding resins for cloth, leather, cork, metal foils, cellophane, wood and certain plastics, as protective and decorative coatings, as binders for wood flour, sawdust, paper pulp, cork, leather and textile fibers, as coatings for textiles and as finishes, fillers and base coatings for leather.

Samples of polyamide resin suspensoids A-000 and B-200 will be supplied for evaluation. Larger quantities from pilot-plant production are also available for commercial use.—General Mills Research Laboratories, 2010 East Hennepin Ave., Minneapolis 13, Minn.

#### EASY TO PROCESS:

##### **Vinyl Resin**

(167B) A new easy-processing vinyl resin for use in the manufacture of draperies, upholstery, table coverings, flooring, electrical wire and cable, as well as many other plastic products for the consumer and industrial fields, has been developed by the Naugatuck Chemical Division of the United States Rubber Co.

Known as Marvinol VR-20, the new resin was developed as the second step in a long-range program to market a complete line of vinyl resins to meet the specialized requirements of the plastics industry.

Naugatuck Chemical is currently marketing Marvinol VR-10, a vinyl resin outstanding because of its high molecular weight, purity and fine particle size. Products based on Marvinol

VR-10 exhibit good toughness, durability, heat and light stability.

Laboratory and field tests have shown the new resin, Marvinol VR-20, to be the easiest processing electrical grade resin yet developed by Naugatuck. It also exhibits outstanding clarity and gloss.

In the calendering field, the new resin will eliminate or drastically reduce the need for copolymer processing-aid resins. Its use will permit lowering Banbury and calendar temperature 10 to 15 deg. F. below previous practice.

Extrusions of Marvinol VR-20 compounds have shown good gloss at temperatures 10 to 20 deg. F. below those used with most other resins and its gloss retention is good even with a high percentage of filler.

The resin may be handled on conventional vinyl-processing equipment.

(Continued)

#### **More Information . . .**

To find out more about any of these new products, circle the item's number on Reader Service Postcard inside the front cover.

#### **This Month . . .**

Makers of industrial coatings will be interested in the brace of new urea resins described on p. 168. Compatible with a wide variety of alkyds, they provide high viscosity also, and can be used in glossy, fast-curing finishes . . . See p. 168 for the story of the exhaustive tests that won acceptance for a non-toxic plasticizer to be used in processing or packaging most products. . . A new butylated urea-formaldehyde resin, described on p. 170, is heat-convertible. . . Stepped-up processing rates at lower temperatures are possible in both Banbury and powder mixing with the new polyvinyl chloride resin discussed on p. 173. . . On p. 174 you'll learn about a pair of azines that absorb ultraviolet light. . . And the four diacetals of pentaerythritol, described on p. 176, have intriguing possibilities.

#### **Next Month . . .**

Watch for exciting news about a highly reactive anhydride of an organic acid. It's gaining steadily in commercial importance. . . Another new chemical you'll learn about next month is an unsaturated secondary alcohol. Those in the protective coatings field will be particularly interested in it.







From SHELL CHEMICAL

# NEW!

Important technical book on

# MEK

(methyl ethyl ketone)

... a comprehensive review  
of its characteristics and  
commercial uses

Since 1931 when Shell Chemical pioneered in the commercial manufacture of MEK, this solvent has become increasingly important to industrial chemical products and processes.

This review of Shell's experience to date with the properties and applications of MEK contains many references to existing literature.

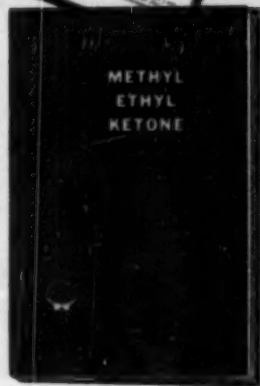
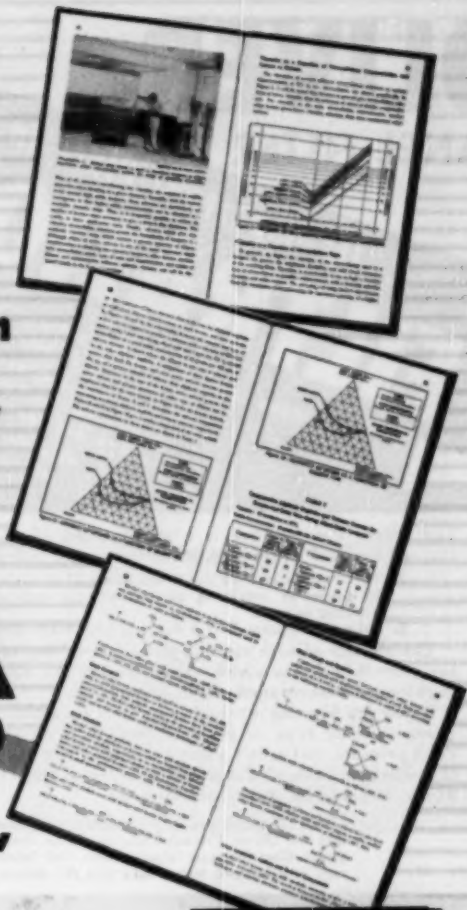
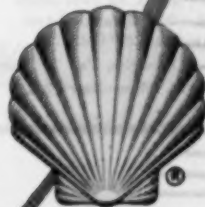
Of particular interest to surface coating manufacturers are the charts and data relating to the use of MEK in lacquers and other finishes.

A copy of the new book on MEK (37 charts, clothbound, 129 pages) will be mailed upon receipt of your letterhead request. Product samples are available for your evaluation. Write Dept. B.

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# OLIVER

## PANEL FILTER

... Its Important Place in  
**FILTRATION**

- (1) Where solids are valuable and must be saved (see note), and
- (2) Where these solids would form an impenetrable thin film tending to quickly slow down filtration, or
- (3) Where the percentage of solids is relatively low

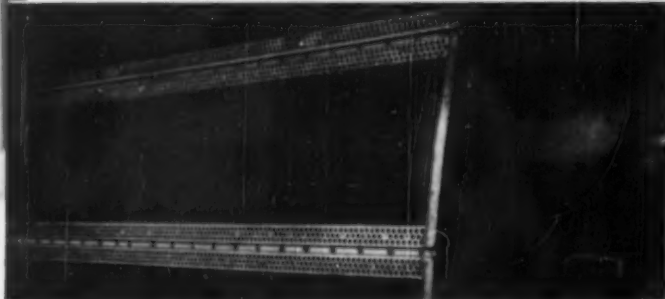
The Oliver Panel Filter is a modification of the standard Oliver Chemical Filter with these two major differences:

1. The cloth is laid on the drum in small sections, being held in place by caulking strips between sections. No wire winding is used.
2. Cake is discharged by a floating adjustable discharger.

The absence of wire winding permits handling and discharging very thin cakes which takes care of the two operating requirements mentioned above (2 and 3).

If you are filtering a valuable product on a plate and frame press or other type of pressure filter because you feel you need pressure and aren't getting a satisfactory rate because of the characteristics of the solids, investigate this Oliver Panel Filter. It could be just what you need.

(NOTE: If solids can be discarded, it is possible that the Oliver Precut Filter might be even a better filter for your requirements. Our laboratory or pilot unit tests would give the answer.)



**OLIVER UNITED FILTERS INC.**



New York—33 West 42nd Street  
Chicago—221 N. La Salle Street  
Oakland—2900 Glascock Street  
San Francisco—260 Calif. St.

Factories: Hazleton, Pa. • Oakland, Calif.  
Export Sales Office—New York

Cable—OLIUNIFILT

### NEW PRODUCTS, cont. . .

similar films were exposed to distilled water and 1 percent solutions of lactic acid, sodium bicarbonate and salt. At the end of 4 weeks of exposure at 34 deg. F. the maximum amount of Santicizer 141 extracted in any case was much less than the minimum amount fed to test animals. Similar tests run at 70 deg. F. did not reveal significantly different results.

Although Santicizer 141 is a good plasticizer for many synthetic resins, it is particularly well adapted for use in polyvinyl chloride and its copolymers. According to Monsanto, it combines the best properties of earlier polyvinyl chloride plasticizers into a single compound. It imparts low-temperature flexibility and improves the processing characteristics of most formulations. It is flame-resistant and non-volatile. The light stability of polyvinyl chloride compositions containing this plasticizer is markedly better than when phthalate plasticizers are employed.

It is expected that the availability of packaging films containing this plasticizer will give new impetus to the growing self-service merchandising of pre-packaged meat and other products. Santicizer 141 is also suggested as a non-toxic plasticizer for beverage tubing, anatomical restorations, baby pants, hospital sheeting and blood plasma tubing.—Monsanto Chemical Co., St. Louis 4, Mo.

### FAST-CURING:

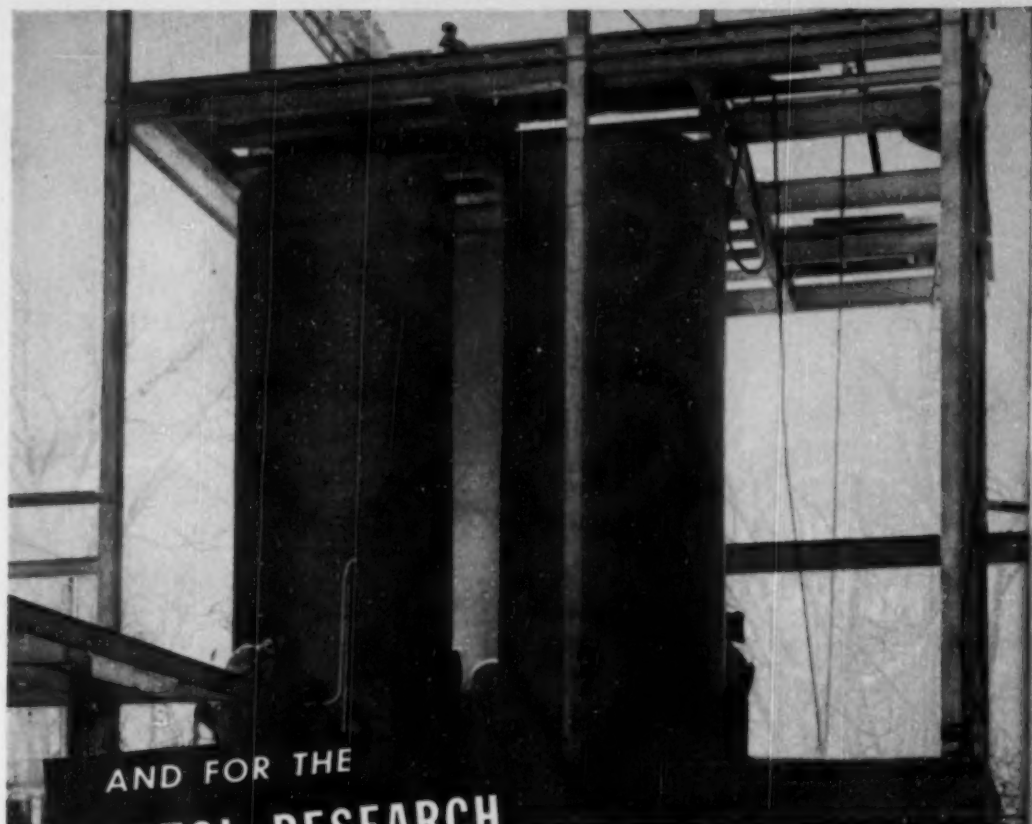
#### Aminoplast Resin

(170A) Monsanto Chemical Co.'s line of aminoplast resins for surface coatings has been expanded to include an improved heat-convertible butylated urea-formaldehyde resin.

This new member of Monsanto's surface coating family, which already includes phenolic and melamine formulations, is Resimene U-901. The urea coating was developed to give the industry a fast-curing resin that imparts high gloss at high hardness and outstanding freedom from cure pattern.

Resimene U-901 may be used for both topcoats and undercoats for metal finishing. Compatible with the usual types of short and medium oil length alkyd resins, the product also operates as a curing agent. The coating may also be used with the usual type resins in catalyzed, low-bake finishes that require cure at low temperatures.

In addition to rapid heat-conversion and high gloss qualities, other properties of the new resin include absence  
(Continued)



AND FOR THE  
**BARTOL RESEARCH  
FOUNDATION...**

The two generator housings pictured here are for one of the most precise atom-smashing machines in the world. Furnished to the Bartol Research Foundation, division of the Franklin Institute, they are each 102" I.D. x 28' 1½" high overall.

These tanks were fabricated by DOWNINGTOWN in accordance with ASME Code, Par. U-68 for 400# working pressure. Shells are 1½" thick of SA-212 Firebox, Grade "B" Steel . . . heads are ASME Code, Elliptical, 1½" minimum thickness of SA-212 Firebox, Grade "B" Steel. Tanks hydrostatically tested at 600# hammer tested, then subjected to an 800# hydrostatic test. Tanks stress-relieved after fabrication by heating 1100° to 1200° F., and held at that temperature at least 1 hour per inch of thickness . . . finally, sand-blasted inside and outside previous to painting.

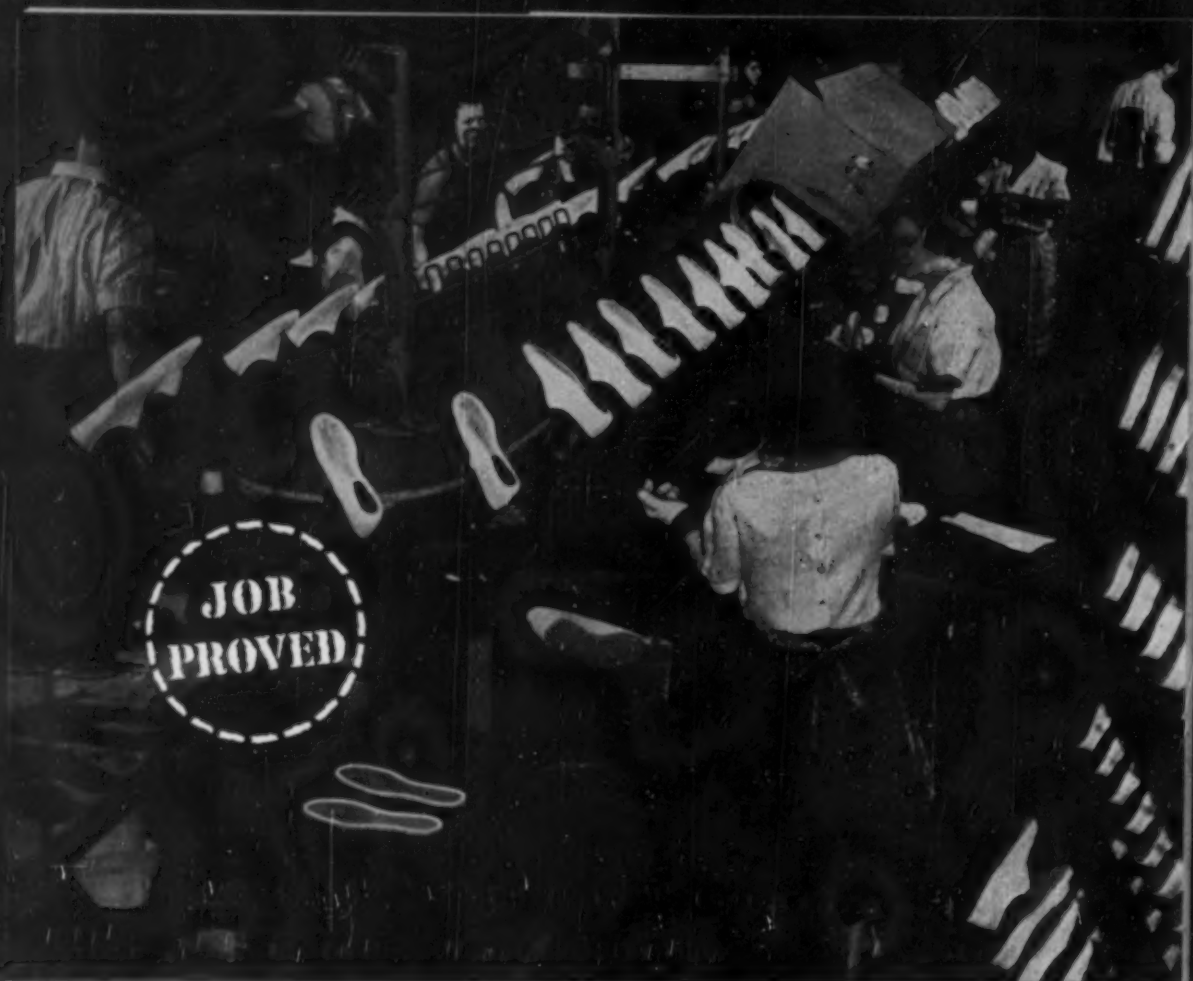
DOWNINGTOWN Engineers and Technicians have given considerable study to many factors and processes of Plate Fabrication. Consequently, we have arrived at conclusions which we firmly believe assure a quality job.

Your inquiries for pressure vessels of Nickel Clad, Stainless, Stainless Clad, Carbon Steel, are solicited. Another important factor of our business is the design and fabrication of Heat Exchanger Equipment.

## **DOWNINGTOWN IRON WORKS, INC.**

**DOWNINGTOWN, PENNSYLVANIA**

**• New York Office: 30 Church Street**



## KEEPS WHITE FOOTWEAR WHITE

### Sun Rubber-Process Aid Solves Costly Discoloration Problem

White rubber footwear discolored in use and colored sportswear soles bled into the white finishing tape. In trying to solve this serious problem, a large rubber manufacturer experimented with 12 specially selected process aids. Only two were successful: a Sun product and one much more expensive.

The Sun process aid was chosen and has proved completely satisfactory. Used to wet pigments, to

soften rubber stocks, to smooth calendering, and to aid plasticizing, it causes neither staining nor discoloration. In fact, the white stocks treated with the Sun process aid keep their whiteness as long as control stocks containing no process aid at all.

Sun rubber-process aids speed up milling and calendering; minimize bleeding and migrating; reduce flex-cracking, heat build-up,

and hardening. Also, they generally increase the resilience of the finished vulcanizate. Sun "Job Proved" process aids are refined for maximum compatibility with the types of rubber for which they are recommended—natural, synthetic, or reclaim. To learn how Sun rubber-process aids may help you, call the nearest Sun Office. The services of a Sun representative are available without obligation.

**SUN OIL COMPANY • Philadelphia 3, Pa.**

In Canada: Sun Oil Company, Ltd.  
Toronto and Montreal

**SUN PETROLEUM PRODUCTS**

"JOB PROVED" IN EVERY INDUSTRY





of undesirable cure pattern, stability in the container, flexibility, color retention in white and pastel enamels and reasonably slow reducibility from package to application viscosity.

Normal baking range for Resimene U-901 is 225-325 deg. F., although it may be baked at higher temperatures for short periods without appreciable discoloration. The resin solution is stable and unaffected by aging under reasonable storage conditions.—Mon-santo Chemical Co., St. Louis 4, Mo.

**PROCESSES EASILY:**

**Polyvinyl Chloride Resin**

(173A) An improved, easy processing Geon polyvinyl chloride resin of high molecular weight has been introduced by B.F. Goodrich Chemical Co. Designated Geon 101 EP, the new resin is available in commercial quantities. It should interest those processors who seek to maintain low operating costs through high rates of production.

Through a new manufacturing technique, Goodrich has been able to incorporate easy processing features into its straight Geon 101 resin, at the same time retaining the superior electrical, chemical and physical properties of this material.

Geon 101 EP resin is particularly adaptable to both Banbury and powder mixing. Tests show that marked increases in processing rates, at reduced temperatures are possible.

Tests run in a high-speed 3A Banbury with the Geon 101 EP resin showed a 25 percent reduction in cycle time with unloaded stocks and a 50 percent reduction with loaded stocks. In runs on a high-speed 11A Banbury, a 50 percent reduction in cycle time with loaded stocks was achieved. On low-speed Banbury mixers a 35 percent saving in cycle time was obtained with loaded stocks.

Powder mixing tests conducted on a Muller type mixer showed reduced cycle time of 50 percent in producing a dry free-flowing powder. Powder mixing cycles with easy processing resins are regulated by the time necessary to obtain adequate dispersion of fillers and stabilizers, and not by drying rate. A free-flowing powder and adequate dispersion are two prerequisites for satisfactory extrusion. Both extrusion speeds and physical and electrical properties of powder-mixed compounds containing easy processing 101 are comparable with those of granulated compounds.

In mill mixing, Geon 101 EP resin does not effect great reductions in  
(Continued)



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with **COLOR!**

If your job involves color formulation and the selection of pigments, you'll welcome the useful information contained in these handy technical reports. They've been prepared by Williams to make it easier for you to quickly select a pigment having chemical and physical properties which hit your color specifications "on the head".

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**108 Shades and Types of Iron Oxide Pigments**



# NEW TAG midge moisture meter

Made by the Makers of the  
Standard TAG-Hoppenstall



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Plaster, Instantly*

Now you can **KNOW**  
when to paint!

Outdoors or in,  
the TAG Midge  
Moisture Meter  
tells you when  
surfaces are dry  
enough for de-  
pendable, pos-  
sible painting!



Test plaster, too!  
This new, should-  
er-strap TAG  
Moisture Meter  
reads dampness of  
plaster... instan-  
tly, directly, with-  
out scoring sur-  
face!



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## SIMPLE!

Just drive electrode needles  
into the wood... press button  
... read moisture percent  
direct!

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Small, compact, light weight.  
Case dimensions:  $4\frac{1}{2} \times 4\frac{1}{2} \times$   
 $3\frac{1}{4}$  inches!

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battery voltage... scale cali-  
brated in percent moisture...  
complete internal polystyrene  
insulation!



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Manufacturers of Tagline and Weston Instruments

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## NEW PRODUCTS, CONT.

cycle time. However, savings of 10 to 20 percent can be achieved with correct mixing procedures.

In both calendaring and extruding with Geon 101 EP, lower processing temperatures may be used than with regular Geon 101. A 5 deg. F. reduction is possible in calendaring and 20-30 deg. F. in extruding.

Rates of extrusion have been increased 20 percent with several types of compounds in which the new resin has been incorporated. Extrusions of transparent belting stock possess higher surface finish and improved clarity, imparting in turn these features to such finished products as belts and decorative trim for shoes and handbags.—B.F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio.

## ABSORB ULTRAVIOLET:

### Pair of Azines

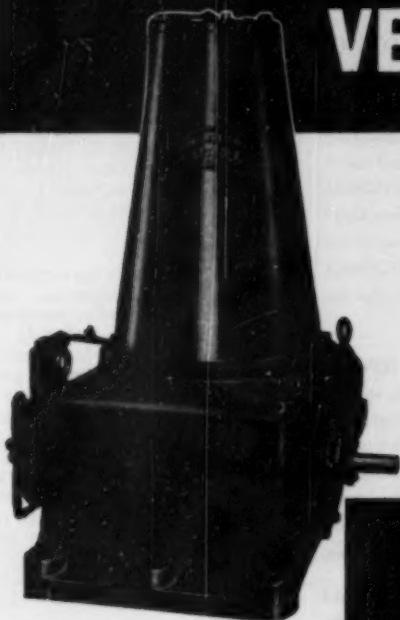
(174A) Two highly efficient ultra-violet absorbing chemicals are being offered for the first time by Pilot Chemicals, Inc. These are furfuralazine and cinnamalazine. They are characterized by very intense absorption in the ultraviolet and by a sharp cut-off at the boundary between visible and ultraviolet light. A film 0.001 in. thick, containing 1 percent of cinnamalazine, will filter out 99 percent of the ultraviolet radiation between 300 m $\mu$  and 390 m $\mu$ . In a transparent film of the same thickness and containing the same concentration, transmission of visible light is substantially complete at 440 m $\mu$ . Furfuralazine, while not quite so efficient as cinnamalazine, is also an excellent ultraviolet absorber. It has the advantage of being essentially colorless in these concentrations.

Use of these azines is indicated wherever a material is exposed to direct sunlight with resultant deterioration. Some possible uses are in outside paints, in plastics and laminated glass for protecting window displays, protective waxes for cars or outdoor furniture, in plastic or lacquer coating for outdoor furniture, in dye solutions for drapes and carpets, for protecting canvas awnings, sails and convertible car tops, and for stabilization of cellulose esters.—Pilot Chemicals, Inc., 47 Felton St., Waltham 54, Mass.

### Cold Sealing Adhesives

(174B) Cold adhesives for making polyethylene film stick to both regular and bleached kraft paper are the series of Resyns made by National  
(Continued)

# For drives requiring long, unsupported VERTICAL SHAFTS



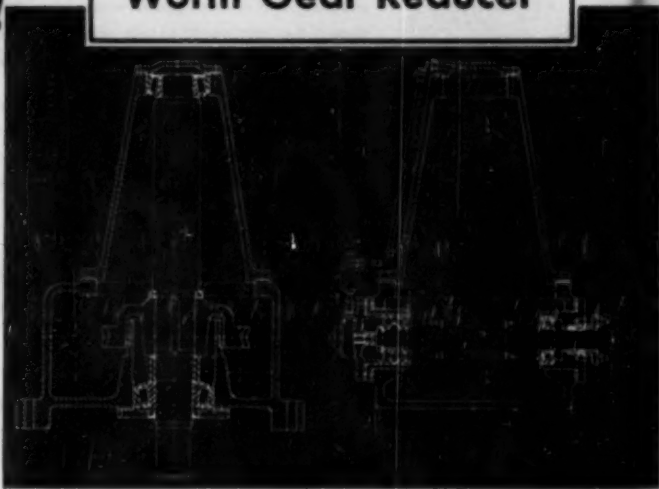
*the answer is*

...the  
**Philadelphia**  
**"STEEPLE" TYPE**  
**Worm Gear Reducer**

The "Steeple" type Vertical Worm Gear Reducer was especially developed, and has had much successful use in the numerous Process Industries for driving: Agitators, Mixers, Circulators, Pumps, Washers,—or any other vertical type drive which calls for sturdy, reliable speed reduction.

The wide bearing span insures rigidity for the extended shaft—and the "dry-well" construction eliminates the necessity of a stuffing box on the vertical shaft. And, to insure positive lubrication of the upper bearing on the vertical shaft, an automatic reversing oil pump, together with a filter, is used.

Write for full details on your business letterhead.



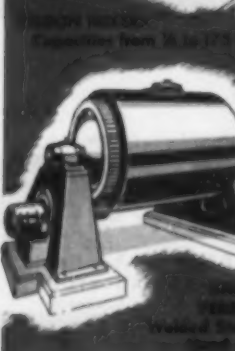
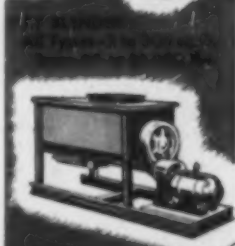
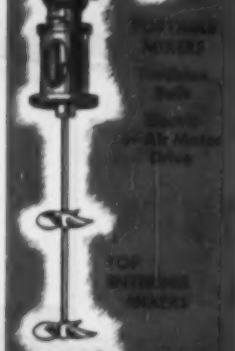
The views above illustrate cross sections through the worm and worm gear shafts.  
Note absence of stuffing box on vertical shaft (at left).

## Philadelphia Gear Works, INC.



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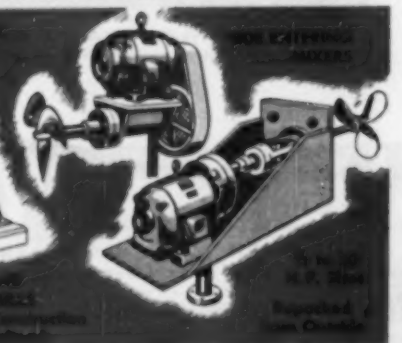
## **INTERNATIONAL ENGINEERING, Inc.**

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### **NEW PRODUCTS, cont. . .**

**Adhesives Co.** Previously, converters depended on heat as a sealing medium. It was originally believed almost impossible to adhere polyethylene with adhesives. But now, with National's newly developed Resyns, adhesion is being successfully accomplished on high-speed machines in the making of polyethylene-lined kraft bags. Promising results are also being obtained in adhering polyethylene to kraft paper, polyethylene to cloth and burlap, polyethylene to itself, and polyethylene to foil. —National Adhesives Co., 270 Madison Ave., New York 16, N. Y.

### **Cozymase**

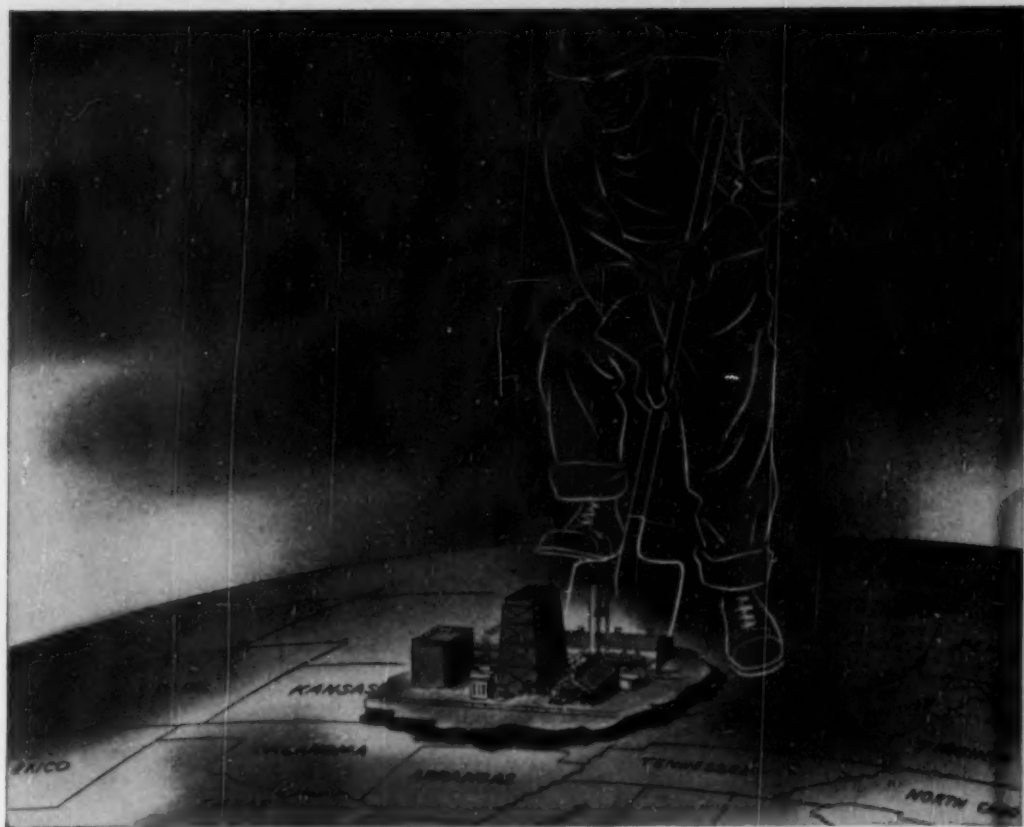
(176A) One of the most widely used biochemical preparations, cozymase, otherwise known as coenzyme-I, diphosphopyridine nucleotide or DPN, has heretofore been available only as a 50 or 60 percent pure preparation. It is now being prepared by the Sigma Chemical Co. with a guaranteed purity of approximately 90 percent. Inability to obtain a reliable high-purity compound has until now delayed vital research by the country's leading authorities. For less critical uses, Sigma also offers a lower priced preparation that assays about 65 to 70 percent pure.—Sigma Chemical Co., 4648 Easton Ave., St. Louis 13, Mo.

### **Diacetals**

(176B) Four new diacetals of pentaerythritol are now offered in pilot-plant quantities by Heyden Chemical Corp. The four compounds are the diformal, the diacetal, the dipropional and the n-dibutyl of pentaerythritol. Possessed of intriguing physical and chemical properties, these new chemicals should be of interest to research chemists as possible intermediates. Samples and technical data can be obtained.—Heyden Chemical Corp., 393 Seventh Ave., New York 1, N. Y.

### **Titanium Alloy**

(176C) Light in weight and high in strength, this alloy which retains basic properties at high temperatures and is highly resistant to corrosion, has been developed by the Navy Bureau of Aeronautics. Composed basically of 5 percent chromium, 3 percent aluminum, and the rest titanium, it is being used in jet-plane parts, where strength at high temperatures is most important. The Bureau of Aeronautics is working closely with industry to facilitate full commercial application.—Department of Defense, Room 2C-759, The Pentagon, Washington 25, D. C. —End



## how to **transplant** a chemical plant



*Works speak louder  
than words*

**GAS PROCESSES DIVISION**

**THE GIRDLER CORPORATION**

**LOUISVILLE 1, KENTUCKY**

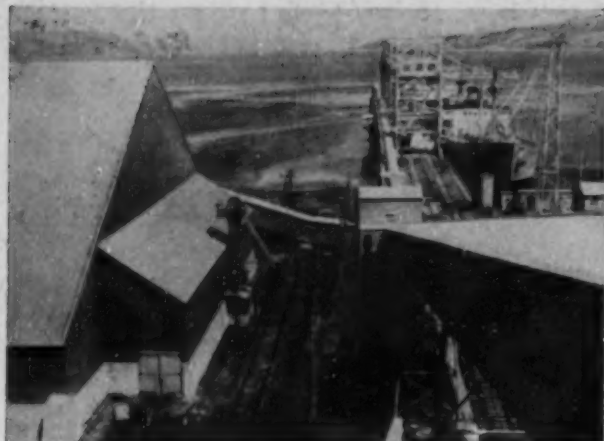
**Designers, Engineers and Constructors**

**WE** THINK a recently completed project pretty well demonstrates Girdler's experience and know-how in plant design and construction. The job was to take apart a complex, 80-ton-per-day synthetic ammonia plant in Louisiana, Missouri, ship the components 900 miles to San Jacinto, Texas, and put the plant back together in good working order. Some 200 new drawings were required to supplement approximately 600 original drawings in order to complete the engineering work.

Each part—and there were thousands—had to be carefully marked for later identification. Some 180 railroad cars were needed to transport the 4500 tons of vital equipment. And the entire operation had to be carried out in unbelievably bad weather . . . snow and ice, the worst sleet storm in 25 years in Missouri, a record-smashing heat wave, a full-scale hurricane, and a deluge of rain—17½ inches in one week—that turned the Texas plant site into an ocean of mud.

The job was tough and troublesome. But we got it done. The plant is up and running again.

Successful handling of this highly technical, extremely complicated task could have been done only by specialists with expert design, engineering, and construction ability. It will pay you to consult Girdler on any project involving the production, purification, or utilization of chemical process gases, liquid or gaseous hydrocarbons, or organic compounds.



SHIPS bring salt during the summer. It is unloaded into a 17,500-ton storage building. Hopper cars carry it 20 miles to the caustic plant at Arvida.



# Chlorine and Caustic

MADE IN CANADA



The new mercury cell caustic plant at Arvida, Quebec, supplies the Aluminum Co. of Canada, Limited, with part of their alkali for refining bauxite. Some of the chlorine is used in their electrolytic magnesium plant and the rest goes to the Canadian market. In 1946, alkali was scarce and power was available from Shipshaw as several of the aluminum potlines were shut down. It was decided to turn one of

the pot rooms and its rectifiers over to caustic soda production. Local conditions were ideal for mercury cells. Alcan engineered the plant with engineers from the Mathieson Chemical Corp. consulting on the design of the cells and brine plant. The Henry Vogt Machine Co. specified the equipment for the chlorine plant. The nominal capacity of the plant is 22,000 net tons of caustic soda per year. The cells (*Chemical Engineering*, November 1947) are rated at 15,000 amp. but provision was made for increasing to 20,000 amp.

Salt arrives by ship at Port Alfred on the Saguenay River during the summer. It is unloaded into a 17,500-ton storage building from which it is shipped by rail, as required, to Arvida, 20 mi. away.

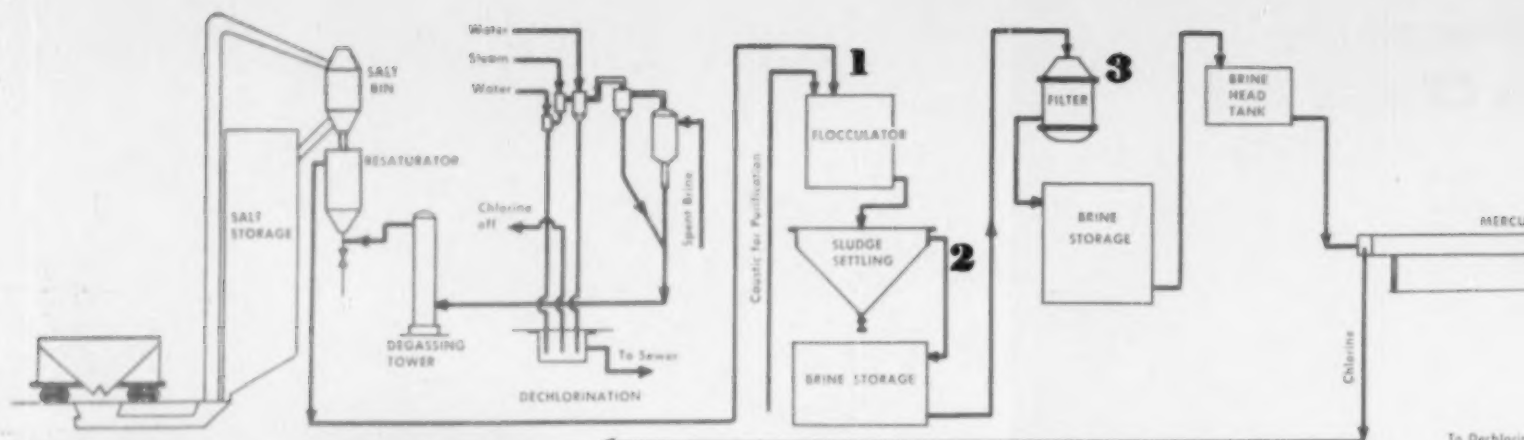
Cell feed is brine that has already been through the cells. It is acidified, dechlorinated and concentrated to 310 g. per l. of NaCl. Brine leaves the cells at 270 g. per l. of NaCl. It is acidified with 30 percent hydrochloric acid

and pumped into a tank of 20 in. Hg vacuum. This takes out dissolved chlorine. The chlorine-free brine passes through a bed of salt to bring the concentration up. Then it is treated with caustic soda and occasionally with soda ash. Flocculators aid precipitation. The brine is then settled and filtered through pressure filters. The brine flows from a head tank back to the cells.

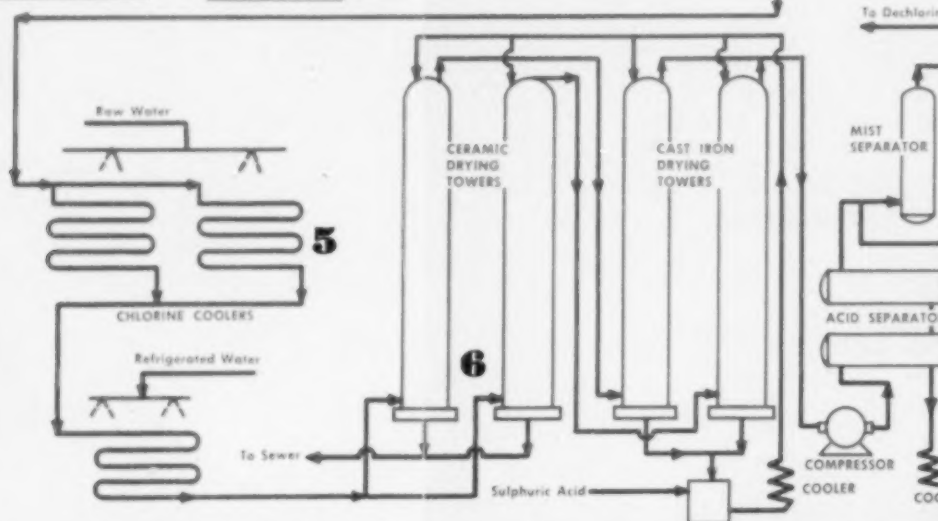
Caustic soda solution at 30 to 50 percent concentration collects in storage tanks beneath the cells and is pumped periodically through an insulated, steam-traced pipeline about a mile long to the consuming plants.

The wet chlorine from the cells is cooled to 60 deg. F., first with mill water and then with chilled water in ceramic coolers, followed by sulphuric acid drying, first in ceramic towers of Mathieson design and then in cast iron towers. The dry chlorine is compressed with Nash compressors to 65 psi. and liquefied with two-stage refrigeration—90 percent at -5 deg. F. by ammonia-cooled calcium chloride brine and 8 percent at -40 deg. F. by carbon dioxide refrigeration. About 2 percent of the chlorine is lost as sniff gas and absorbed in milk of lime. A small part of the chlorine is burned with hydrogen from the cells to provide hydrochloric acid for brine treatment. The burner, absorber and acid pump in the acid plant are all of graphite or Korbate construction.

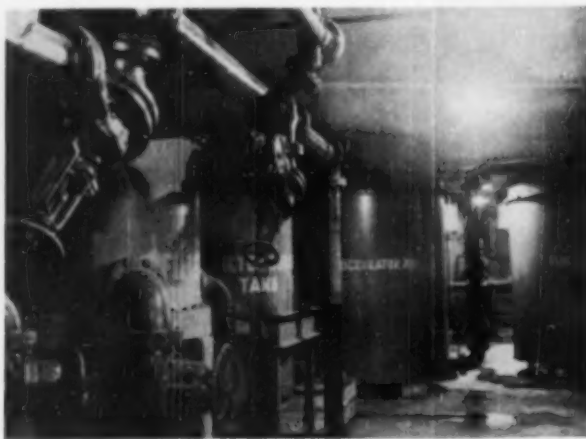




**1** FLOCCULATORS help in purifying brine. Also seen above: seal tank at the bottom of the barometric leg, and the bottom of the saturator.



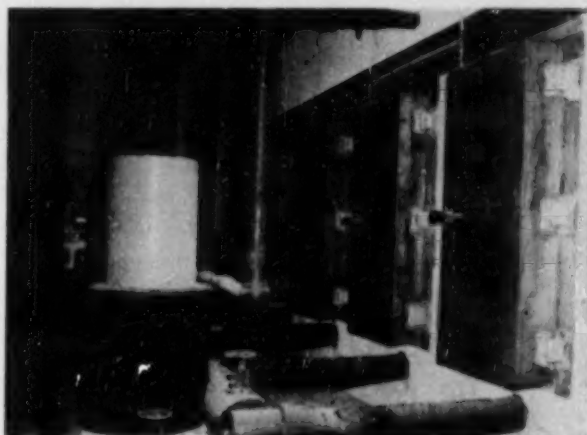
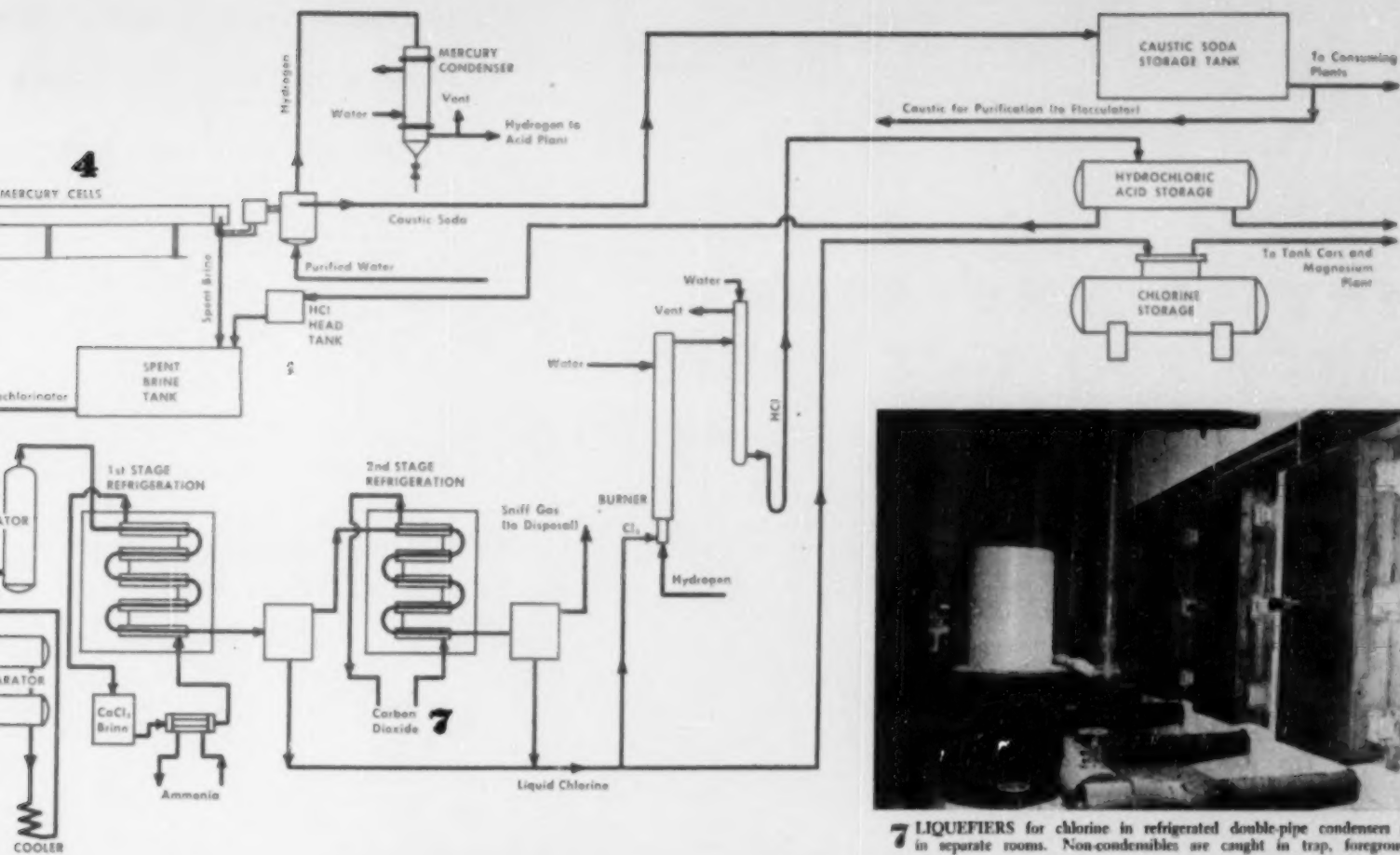
**2** SETTLERS remove solids. Treated and flocculated brine is introduced at the center and it flows to the ring launder around the periphery.



**3** FILTERS polish the settled brine. They are rubber lined and their porous stone filter tubes are precoated with diatomaceous filter aid.



**4** CELLS at the Arvida plant. On the left: gas decomposers; and pipe connections.



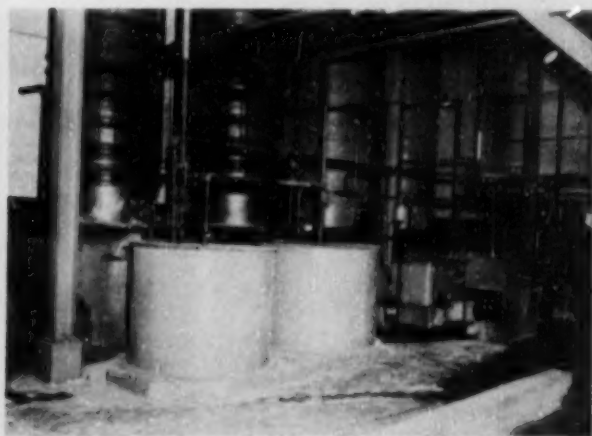
**7 LIQUEFIERS** for chlorine in refrigerated double-pipe condensers are in separate rooms. Non-condensibles are caught in trap, foreground.



the aisle end are mercury pumps; amalgams for water, caustic and hydrogen.



**5 COOLERS** reduce the temperature and condense out much of the water from the hot, wet chlorine gas that comes from the electrolytic cells.



**6 TOWERS**—two stoneware and two cast iron—where chlorine is dried. The gas passes up the towers countercurrent to the sulphuric acid.



It was 1912 — and dances like the "Turkey Trot", "Bunny Hug" and "Fox Trot" caught the public's fancy — when we introduced "Flexitallic", the original Spiral-Wound Gasket, and opened to industry new fields of opportunity in the confining of fluids at high pressures and temperatures.

## "WHAT IS THE RIGHT GASKET FOR THIS JOB?"

Every Flexitallic Spiral-Wound Gasket is engineered from the ground up for operation at specified temperatures and specified pressures—and to meet particular conditions of thermal and physical shock, corrosion, vibration, or unusual joint stress.

The basic Flexitallic principle—the spiral winding of V-crimped spring-like metal plies alternating with plies of filler—lends itself to almost unlimited variation in material and structure to meet the varying demands of use.

The physical and chemical properties of the metal, the type of filler, the relationship of filler to metal in the winding—all these are variables in the hands of the Flexitallic engineer who is designing a Flexitallic Gasket for a specific use.

Using the most precise instruments for the determination of yield values, resilience and gasket density, the Flexitallic engineer builds

each Flexitallic gasket to an exact standard of performance.

Many Flexitallic Gaskets—originally designed as "specials" for oil refineries, chemical industries, power plants, shipyards, ship operating companies—are now "standard" gaskets in the Flexitallic line.

If safe sealing is of serious concern to you, give us these facts on your gasketing requirements: (1) Fluid to be confined; (2) Type of flange and dimensions; (3) Operating pressures and temperatures; (4) Bolting data.

In return we will send you a genuine Flexitallic Spiral-Wound Gasket. Test it severely—in your laboratory or on the job. The results will show you why most industries in the high-pressure, high-temperature field are standardized on Flexitallic Gaskets.

FLEXITALLIC GASKET COMPANY  
Eighth and Bailey Streets, Camden 2, N. J., U.S.A.

The name "Flexitallic" is the registered trade mark identifying the original (patented) Spiral-Wound Gasket. Now—for your protection and ours—this trade mark FLEXITALLIC is stamped into the outer ply of every genuine Flexitallic Gasket. Your guarantee of quality.



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### SMALL STEEL LIFT CHECKS WITH BETTER

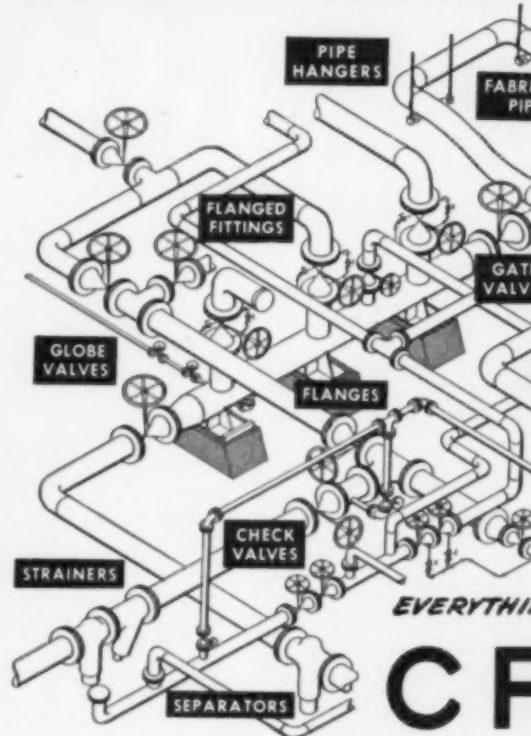
Looking for small steel lift checks that don't clog? Then specify Crane 600-Pound Forged Steel Lift Checks. Their patented cap-sleeve construction that provides lift, even at low velocities, thereby eliminating pounding and chattering. Special design of body and port openings give unusually low pressure drop.

Seats and discs are of wear-resisting Crane Rugged, forged steel bodies will withstand severe pressure services.

You can get these checks with union caps, or socket welding ends, sizes 1/4 through 3/4 inch—bolted cap, screwed, socket welding, or flange—sizes 1/2 through 2 inches. See your No. 49 Crane pages 248-249.

CRANE CO., 836 S. Michigan Ave., Chicago  
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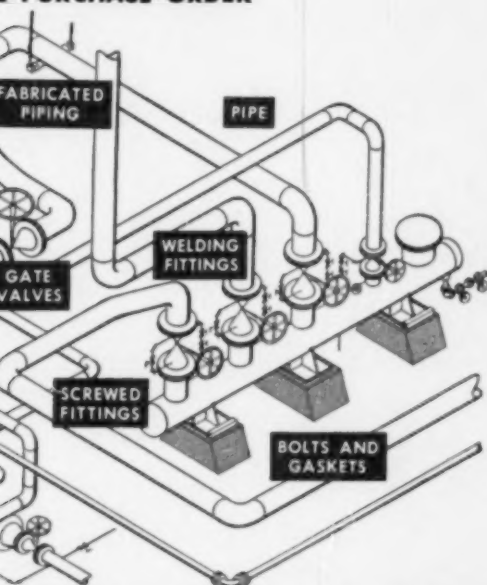
Don't chatter, and  
specify these  
fits. They have a  
divides high disc  
ting destructive  
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Crane Exelloy.  
and severe, high

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Industrial Areas

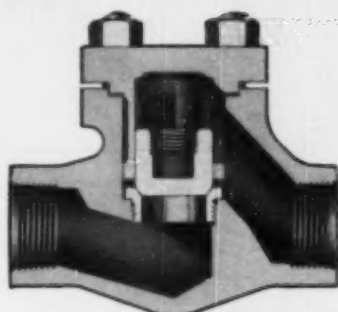
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100% Minus	Range of
325-Mesh	VERTICAL
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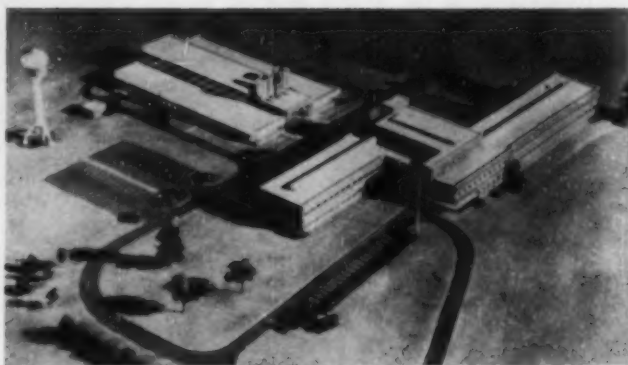
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# Chemical Engineering News

JOSEPH A. O'CONNOR, News Editor



## Big New Industrial Research Laboratories Under Construction for Armstrong Cork

Construction of new Armstrong Cork Co. laboratories comparing with the most modern and attractive industrial research and development facilities in the country has been started at Lancaster, Pa.

The firm of Henry E. Batton, Inc., of Philadelphia, has been awarded the contract for construction of the laboratories.

The new research buildings will be built on a 40-acre site four miles west of Lancaster, location of the home offices of the company. It is expected that the new facilities will be ready for use early in 1951.

Designed by the architectural firm of Shreve, Lamb & Harmon & Associates, of New York City, the laboratories will include the latest developments in industrial research, design, and equipment. The main research building will be of two- and three-story brick and steel construction. In addition to the main building, a large single-story pilot plant, smaller pilot plants, and a boiler house will be built as part of the same project.

The company's present general research activities are located in buildings originally designed and constructed for factory purposes. These have become inadequate as laboratory buildings. For some time, officials say, the company has needed new research facilities to serve its 18 plants

in the United States and its operations abroad. The company has relied heavily upon research for many years to keep abreast of its markets by offering complete lines of its products and improving and developing new materials and methods.

### New Du Pont Unit to Produce Orlon in Staple Fiber Form

Plans for construction of a new unit at Camden, S. C., to manufacture Orlon acrylic fiber in staple form are announced by E. I. du Pont de Nemours & Co., even before the first unit of a new yarn plant there is completed. Orlon is Du Pont's newest synthetic textile fiber.

The new plant will be a separate unit to be constructed at Camden next to the plant being built for manufacturing Orlon in the form of continuous filament yarn. Research on the staple process is being increased from a laboratory-scale operation to a pilot-plant operation at the company's Waynesboro, Va., research laboratory.

Employment at the Camden plant, which is named the May Plant for Benjamin M. May, retired general manager of the Rayon Department, is expected to be increased by approximately 1,000 new operating jobs when the staple unit is completed. About

500 employees will be required to operate the yarn plant, which is scheduled to start production this summer.

Construction of the staple unit will be handled by the company's Engineering Department, with sub-contracts for such specialties as job conditions warrant. James D. Wilson, field project manager, and the greater portion of his present construction staff, will remain at Camden to supervise the building of the new unit.

The new building will be approximately 250 ft. by 1,000 ft. of single and multiple-story construction. In design, it will follow the pattern of the yarn plant, being built of structural steel frame and jumbo-brick exterior walls. Interior walls will be largely tile and other modern lining materials. The main portion will be air conditioned for comfortable working conditions.

Services such as cafeteria, medical, and employment will be provided through facilities being built at the yarn plant. Electric power will be purchased.

The most modern types of safety features will be built into the new unit to conform to the standard of the yarn plant, which is designed for protection against all types of process and industrial hazards to insure the maximum safe working conditions for employees.

On April 8, 1948, Du Pont purchased the Camden site of approximately 800 acres on the Wateree River. The yarn plant was announced on Oct. 21, 1948, and plant construction was started on February 21, last year.

### GR-S Latex Masterbatched With New Carbon Blacks

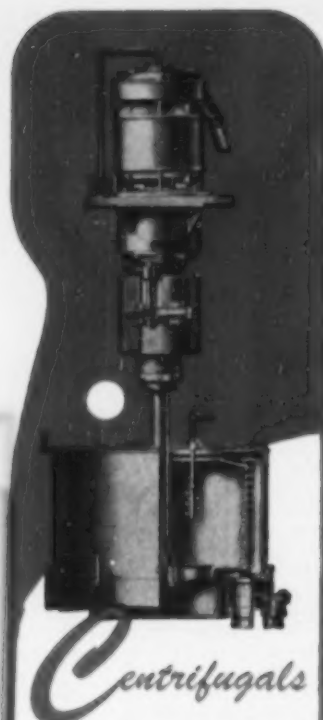
The tires on your car will give you 1,500 to 2,000 mi. more wear because of new advances that have been made in the blending of cold synthetic rubber and chemicals.

These advances were reported by three United States Rubber Co. scientists at the 117th national meeting of the American Chemical Society in Detroit.

To the Society's Division of Rubber Chemistry, James W. Adams, W. Earl Messer and Louis H. Howland re-

(Continued)





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**The  
WESTERN STATES  
MACHINE COMPANY**  
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News, cont. . .

vealed the details of the first successful blending of new high-abrasion carbon blacks and cold synthetic rubber in latex or liquid form.

The process, which is known as masterbatching, is now being used to produce rubber for tire treads at the synthetic rubber plant operated by U. S. Rubber at Borger, Tex.

Usual method of blending carbon black, a valuable reinforcing agent, and rubber is to mix them dry in powerful masticating equipment.

The masterbatch process consists of blending carbon black in water with rubber in a latex form. The compound is then changed with salt and acid solutions to a dry rubber already containing the necessary amount of carbon black.

Natural rubber has been compounded almost exclusively by the dry-mix method. Synthetic rubber, however, is well suited to the masterbatching technique.

By supplying rubber goods manufacturers with synthetic rubber and carbon black pre-mixes, it has been possible to improve product quality, reduce drastically milling and blending time and to maintain cleaner fabricating plants.

Almost any variety of general purpose synthetic rubber (GR-S) has been readily adaptable to the masterbatch process and considerable progress has been made in masterbatch techniques.

It was only recently, however, that it was possible to blend the newer types of carbon blacks, known as high-

abrasion furnace blacks, with cold rubber.

This technique is now being used in full-scale production at the Borger plant.

Sufficient information is now available to prove that automobile tire treads made from latex-masterbatched, GR-S will wear 1,500 to 2,000 mi. longer than similar tires made from dry-mixed carbon black GR-S compounds. This represents approximately 7 percent more tire wear based on an average tire life of from 20,000 to 30,000 mi.

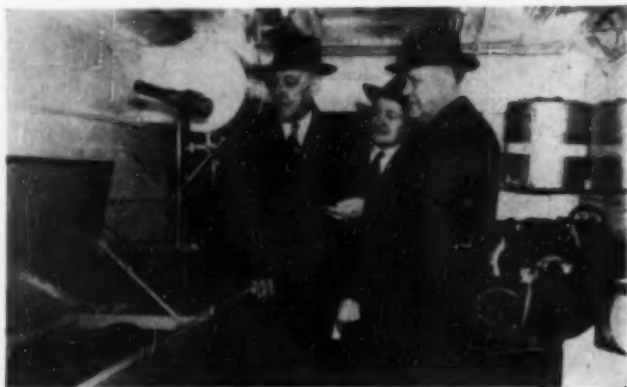
High hopes are also held for even further improvement in tire tread wear through a new technique of blending carbon black and synthetic rubber known as high-speed homogenization. This development is still in the laboratory stage, however.

### Luckey: Little Known Link In Atomic Energy Chain

Luckey, Ohio, a village of 1,000 in Wood County, 25 mi. from Toledo, is not as well known as Oak Ridge or Los Alamos. Nevertheless, it is an important link in the atomic energy chain.

Luckey is the site of an Atomic Energy Commission plant operated by the Brush Beryllium Co. of Cleveland. The product, of course, is beryllium, next to magnesium the lightest structural metal.

Beryllium is a moderator, put into an atomic reactor to slow down neutrons for atom splitting. Moderators (Continued)



NEW MOBILE AIR POLLUTION LABORATORY

One of the most important instruments in Pennsylvania's new mobile air pollution laboratory is this MSA electrostatic sampler used in atmospheric sampling for dusts, fumes and smoke. It is being examined by Pennsylvania's Health Department Secretary Dr. Norris W. Vaux, Industrial Hygiene Director Dr. Joseph Shilen and Mine Safety Appliances Co. President George H. Deike, Sr., shown left to right. The mobile laboratory, built by Mine Safety Appliances Co., will be used by the Pennsylvania Health Department's new Air Pollution Division to investigate smog and other atmospheric contamination throughout the state's industrial areas.

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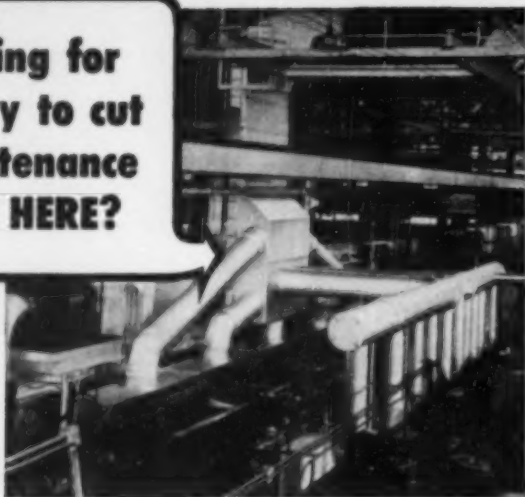
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Beltor Works	Farm Machinery	Leather	Quarrying	Soft Drink
Brewing	Food	Match	Railroad	Sugar Refining
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**Johns-Manville**  
**TRANSITE** Industrial **PIPE**  
Vent

News, cont. . .

are essential in the development of atomic energy for peaceful purposes.

The Luckey plant backs up Ohio's claim to first place in the small but vital beryllium industry. Only three producers are in the field: Brush; Clifton Products of Painesville, Ohio; and the Beryllium Corp., Temple, Pa.

Beryl, the ore of beryllium, is 90 percent imported. Most of the supply comes from Brazil, some from India and Australia.

Luckey's beryllium plant, comprising 16 buildings on a 200-acre tract, got its start during the war in processing a local resource. It was built to make magnesium metal out of dolomite, the high-magnesium limestone of northwestern Ohio. After the war the plant was closed. It got into production of beryllium late in 1949.

### Tocopherol in Petrolatum Permitted by USP Revision

Addition of vitamin E (tocopherol) to white mineral oil (liquid petrolatum) for purposes of stabilization has been authorized under an amendment to U. S. Pharmacopeial standards for liquid petrolatum, it was recently announced by the USP committee of revision.

Use of vitamin E for reinforcing and stabilizing white mineral oil is  
(Continued)

### CONVENTION CALENDAR

Manufacturing Chemists Association, annual meeting, Hotel Monmouth, Spring Lake, N. J., June 19-20.

Chemical Institute of Canada, 33rd annual conference and exhibition, Royal York Hotel, Toronto, June 19-22.

American Society for Engineering Education, annual meeting, University of Washington, Seattle, June 19-23.

American Council of Commercial Laboratories, Cleveland, June 22-23.

American Society for Testing Materials, 53rd annual meeting, Chalfonte-Haddon Hall, Atlantic City, June 26-30.

International Microchemical Congress, Graz, Austria, July 2-6.

Society of Chemical Industry, 69th annual meeting, Newcastle-on-the-Tyne, England, July 10-14.

Third Western Packaging Exposition, San Francisco Civic Auditorium, San Francisco, August 14-16.

National Association of Power Engineers, National Power Show, Hotel Jefferson, St. Louis, Mo., August 14-18.

Metal Mining Convention and Exposition, Fairgrounds, Salt Lake City, August 28-31.

# IN MANY CASES THE BANBURY PROVIDES The Key To Efficient Processing

Where a Banbury mixer is to be an important unit in the production line, the efficiency of the entire setup can often be regulated by carefully planning the installation and operation of this unique machine in advance.

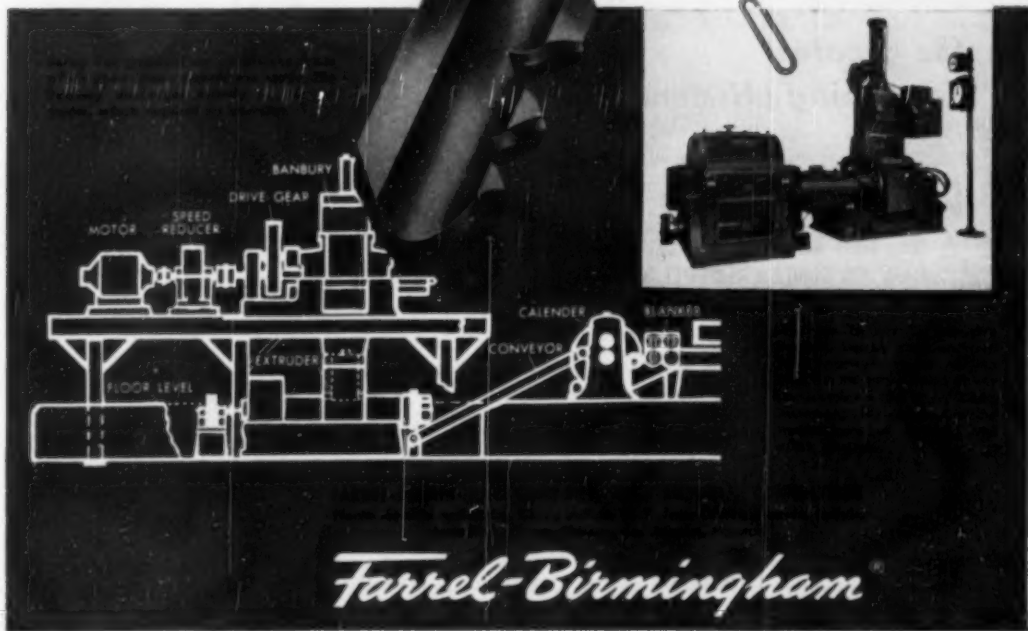
Banbury mixers are available in a wide range of sizes, which means that a machine of the proper pounds-per-hour output can be chosen to match the capacities of the other units in the line. Methods of installing Banburys have been developed which now make it possible practically to eliminate the manual handling of stock to and from auxiliary equipment.

Improvements in operating technique and in the design of the machine itself have made the production of successive batches more and more uniform. With the addition of control equipment, such as a timing device, temperature recorder and discharge mechanism, each operation in the mixing procedure can be automatically controlled and an even flow of production assured.



Standard Size 11  
Plastics Banbury Mixer

**Write for further information  
about the Banbury mixer or  
for engineering assistance  
in designing an efficient  
processing layout.**



*Farrel-Birmingham*

covered by patents held by L. Sonneborn Sons, Inc., New York, petroleum refiners. Sonneborn, however, has offered to grant royalty-free licenses to use vitamin E under the above patent where such products are required by U. S. government regulations to be of USP quality.

### Goodyear Plans Fourfold Increase in Vinyl Output

In a move to quadruple output and simultaneously to enlarge its line of vinyl resins for the plastics industry, Goodyear Tire & Rubber Co. will shell out \$2.25 million for an expansion program at Niagara Falls, where Pathfinder Chemical Corp., a subsidiary of Goodyear's Chemical Division, is located.

While no figures on potential production have been revealed, the program as mapped by P. W. Litchfield, Goodyear board chairman, will put the Goodyear organization, now the world's largest rubber company, among the nation's top producers of vinyl resins.

Dr. R. P. Dinsmore, vice president in charge of research and development,

says the present line of vinyl resins will be greatly expanded. Considerable work has already been done in the Akron research laboratories, he reports, on additional resins for specific uses. Instead of modifying resins in his own plant at considerable trouble and expense, a plastics manufacturer will be able to get from Goodyear a resin that has been tailored or modified during its original production to meet his particular needs.

Engineering and preliminary construction work at Niagara Falls is already under way. Initial expanded production is scheduled to start before the end of this year. Existing processing units, which take acetylene and hydrogen chloride from nearby suppliers by pipeline, will be enlarged to handle the increased production.

Goodyear's present vinyl production process joins the two gases to form vinyl chloride, a liquid, to which are added water, a catalyst and an emulsifying agent to form a solid material. The moisture is driven off this material and the resulting granular resin is ready for shipment.

The Pathfinder Chemical operation, managed by Frank Manchester, a veteran Goodyear chemist and production man, was built during the closing days of the war. Last year it com-

pleted an expansion program that more than doubled its originally scheduled output.

### New Lab Probes Markets For Chemicals in Foods

A food technology laboratory to investigate the application of chemicals in the food industry has been established at Anniston, Ala., by Monsanto Chemical Co. It is one of the few such laboratories in the chemical industry.

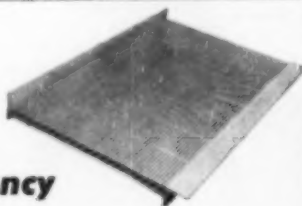
The laboratory, which will continue the chemical leavening research previously conducted by the company's Phosphate Division, will serve Monsanto's six operating divisions on problems related to food and food processing. It will also act as liaison with the food industry and with university and government laboratories.

A company-wide advisory committee, with H. V. Moss, assistant research director at Anniston, as chairman, will guide the work. Theodore W. Schilb, formerly chief chemist at Monsanto's Carondelet, Mo., plant, is group leader in charge of food technology research.

Work in the food technology lab-

(Continued)

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Because of their outstanding advantages, Hendrick Wedge-Slot Screens are being used in a continually widening variety of chemical processing applications.

The slots extend uninterruptedly the entire length of the screen, and standard widths of slot openings range from 1/120" to 1". Profile bars are made in varied shapes to meet specific requirements most effectively. Screen segments can be curved on any specified radius greater than 6" for equipment on which curved screens are required.

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Hamer RIGID Line Blind Valves solve the problem of effecting a positive blind shut-off in piping installations where endwise movement of the line is impossible. Now, for the first time, the advantages of the safe, speedy, one-man operated Hamer system of blinding can be incorporated in rigid pipe lines and manifolds in refineries, process plants, and on ship board, as original equipment in new installations, or as replacement of existing valves.



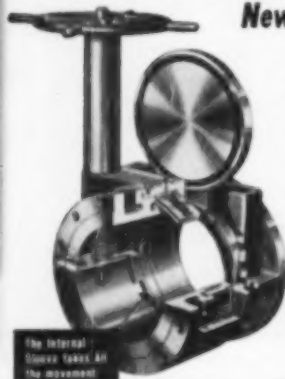
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### New Internal Expansion Feature

Face-to-face dimensions of Rigid Line Blind Valves conform to A. S. A. Standards for steel wedge gate valves and are not changed when releasing or sealing off the spectacle plate. An internal sliding sleeve, actuated by a ball-bearing mounted ring gear, takes all the movement and eliminates spreading the line.

Examine the cross section and you'll see these other important features. • **Enclosed plate slot**—eliminates loss of product, mess and fire hazard for fluid can't spill while plate is being reversed. • **Rigid body**—unaffected by misalignment or line strains. • **All working parts enclosed**—packed in grease for smooth action; sealed against line fluid. • **Positive shut-off or full-open fluid passage**—There's nothing like a Hamer Line Blind Valve for positive action, easy operation, long service and SAFETY.



The internal  
sleeve takes all  
the movement

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There is a Hamer Line Blind Valve for every blinding application. Illustrated below: 1—Special-Type, side mounted hand wheel. 2—Special-Type, upright hand wheel. 3—"Tee" and "Elbow" Line Blind Valve. 4—Economy 3-Bolt Type.



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NEWS, cont. . .

oratory will not involve the synthesis or preparation of new compounds, but will coordinate such new chemical research within Monsanto. "Our primary function," Schilb says, "is to determine where chemicals can improve the quality of food. Such chemicals should be really useful and safe and not be employed to conceal inferiority." In 1949 Monsanto made 7.2 percent of its total sales to the food industry.

While progress has been made in preserving and maintaining the fresh flavor and nutritive values of foods, chemicals have just begun to play their part, thinks Roy E. Morse, another member of the Anniston research staff and former professor of food technology at the University of Georgia. Chemicals can aid in the control of enzyme and microbiological activity where other methods cannot be used or are inadequate. Dr. Morse points out. Chemicals also can prevent oxidation, particularly of chemically active oils and fats in some foods that become rancid. Oxidation also affects the taste, color and vitamin content of many other foods.

### Sun Completes Expansion Of East Toledo Refinery

Expansion of Sun Oil Co.'s Toledo refinery, which was started in 1948 as a \$16 million project but turned into a \$22½ million job, has been completed.

The East Toledo plant has been almost doubled in size and now is regarded as the biggest in Ohio and the twenty-fourth in size in the U. S. It has an ultimate daily crude oil capacity of 70,000 bbl.

When all new units are in full operation Sun's Toledo employees will number about 950, up some 200 from previous levels.

Key in the expansion is the towering quadruple-reactor Houdrifirow unit. It reaches 308 ft. skyward. Sun officials say it is the tallest refinery unit in the world and the first of its kind.

This new catalytic cracking plant has a capacity of 30,000 bbl. of charging stock. It will produce more than 600,000 gal. of gasoline a day.

Market-wise, expansion of the refinery means Sun will be in a better position to supply motorists in the Midwest with a larger volume of premium gasoline at regular prices.

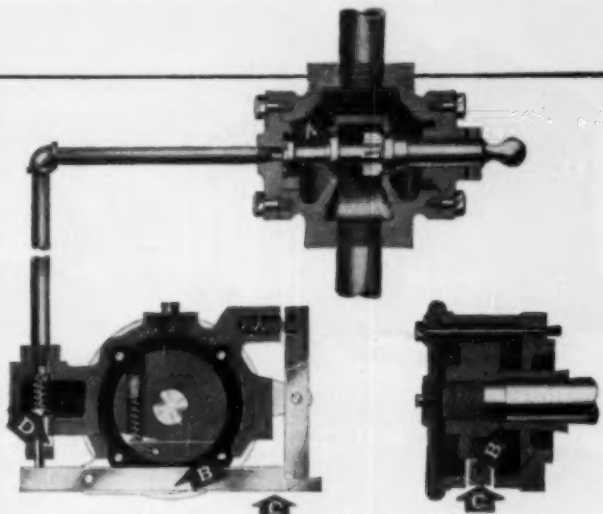
Other units of the Toledo expansion include a new steam-generating facilities, a compressed air supply, a new electrical substation, 650,000 bbl.

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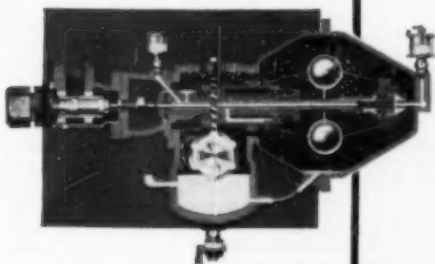
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excess speed safety trip



The constant speed governor on Coppus Turbines, plus this Excess Speed Safety Trip, gives you extra protection for your turbine investments. Here's how it works. When steam is turned on, pressure opens valve A fully. When excess speed is reached, centrifugal force throws weight B against lever C lifting pilot valve D. This releases pressure in back of valve A, closing this valve instantaneously, to shut off the steam. Safety trip can be tested easily while turbine is running by manually tripping and resetting lever C.



Sectional view showing lubricating system of fully enclosed Coppus Constant Speed Governor. Governor head acts directly on stem of steam admission valve. No external levers required. Ball bearing construction eliminates end play and gives frictionless operation.

Coppus Turbines ranging from 150 hp down to fractional in 8 frame sizes

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When you choose from the Coppus Steam Turbine line, you get the right size for your requirements . . . and make substantial savings on any size from the 150 hp turbine down to the smallest. Low in first cost, Coppus Turbines save you more money in the long run. Operating and maintenance costs are kept low by such other features as: large number of steam nozzles, controlled individually by manually operated valves; hard chromium plating on shaft at the stuffing box; replaceable cartridge type bearing housings; optional carbon ring packing assembly for back pressures up to 75 pounds.

WRITE FOR BULLETIN 135

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OFFICES IN PRINCIPAL CITIES OF NORTH AND SOUTH AMERICA

NEWS, cont. . .

in new tankage, an extension of the main office, and a combination office, first aid and men's building for the new operating units.

A \$600,000 waste-water separator and sewage systems have been installed to recover undesirable components from water used in processing before it flows into Otter Creek.

Sun Oil was born in Toledo 55 years ago. Its first refinery, a \$22,000 project located on the site of the present plant, was surrounded by oil wells from which it drew its crude. General offices of the company are now in Philadelphia.

### Air Filter Designed for AEC May Lick Industrial Smog

A new inexpensive paper-like filter material designed for filtering fine radioactive particles from contaminated gaseous wastes has been developed for the Atomic Energy Commission by Arthur D. Little, Inc., Cambridge, Mass., research and engineering organization. The development may have general commercial or industrial use, for instance in filtering the smokestack gases that now cause fumes or smog.

The new material contains treated paper-making fibers in combination with very finely divided mineral asbestos fibers. The material is made in soft, flexible sheets that can be pleated and formed into shapes to fit filtering units of large capacity.

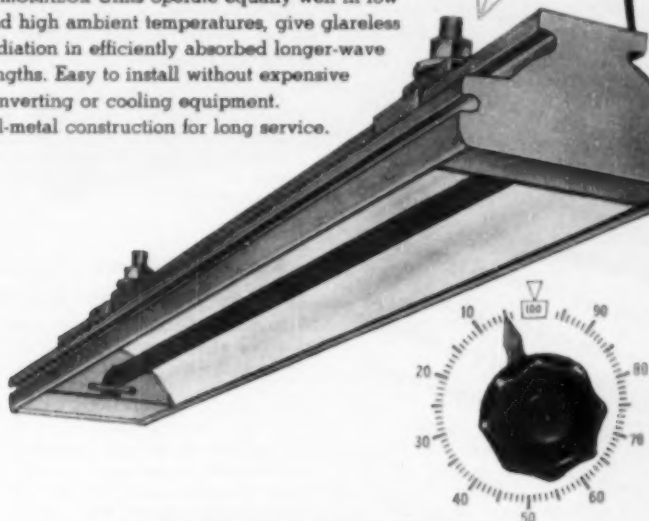
AEC facilities using cooling or ventilating air that might become contaminated with radioactive particles take extreme care to eliminate such particles before the air is discharged into the atmosphere. Air filters developed and used by the Chemical Warfare Service for protection against gas warfare have proved satisfactory, and for some years the Army has been supplying AEC with filter units. With the expansion of the atomic energy program, however, the demand for filters has grown rapidly. In order to develop alternate sources of supply and possibly to reduce filter costs, the AEC initiated a program for filter research and development.

The material was developed by Arthur D. Little, Inc., under contract with AEC. The paper can be made on relatively slow foundry machines of a type found in a large number of paper mills fabricating soft saturating papers. Thus, the atomic energy program can be assured a diversified source of supply.

It is believed that this filter de-  
(Continued)

## Uniform, exact infrared heat at the turn of a dial

You can "dial" the exact uniform heat you need to fit the job in infrared drying, baking, preheating, curing, dehydrating and similar applications when you use CHROMALOX Electric Radiant Heaters. Compact CHROMALOX Units operate equally well in low and high ambient temperatures, give glareless radiation in efficiently absorbed longer-wave lengths. Easy to install without expensive converting or cooling equipment. All-metal construction for long service.



### CHROMALOX Radiant Heaters

**trouble-free** All-metal unit withstands shock, vibration, dust, blows and rough handling. Not affected by splashed liquids; nothing to shatter.

**flexible heat** Precise temperatures at the turn of a dial, easily regulated for changed working requirements. Ovens can be zoned for stepped-down heat.

**color-blind** Chromalox Radiant Heat ignores color variations; longer-wave length infrared is absorbed equally by all colors, textures, surfaces.

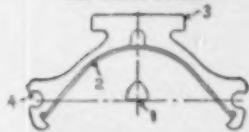
**uniform heating** Light, dark or multicolored work may be processed simultaneously. Proper heater positioning assures an even blanket of heat without hot-spots.

### CHROMALOX

*Electric heat for modern industry*

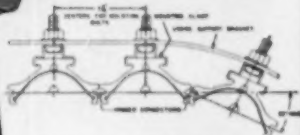
Only **Chromalox**  
Radiant Heaters offer  
these features

#### ALL-METAL DESIGN



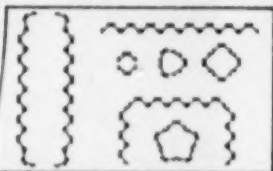
1. Inconel-sheathed Chromalox triangular heating element.
2. Highly polished, non-oxidizing reflector.
3. Rigid, extruded metal housing.
4. Interlocking connector for assembling banks of heaters.

#### QUICK, EASY INSTALLATION



Clamps and interlocking joints simplify assembly of units into ovens, banks, tunnels, etc.

#### VERSATILE APPLICATION



Cross-section views of a few of the many oven designs possible with Chromalox Radiant Heaters.

For more Know-How  
Send for complete Application File

It shows you how many others are saving time, and increasing production with Chromalox Radiant Heaters.

EDWIN L. WIEGAND CO.  
7514 Thomas Boulevard  
Pittsburgh 8, Pa.

Yes . . . send me the application file on  
Chromalox Radiant Heaters

Name \_\_\_\_\_  
Company \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_  
State \_\_\_\_\_

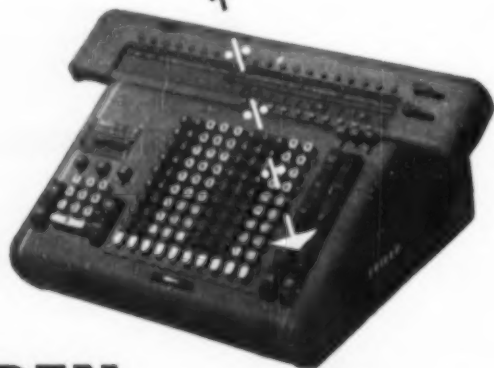


# DIVISION

*made simple*

- ✦ FRIDEN, the only Calculator 100% automatic in
- ✦ Division. Yes, regardless of the size of the figures...
- ✦ the relationship in sizes between the divisor and
- ✦ the dividend...only the Friden will automatically
- ✦ align—to the proper dividing position.
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Friden Mechanical and Instructional  
Service is available in approximately 250  
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**FRIDEN** CALCULATING MACHINE CO., INC.

HOME OFFICE AND PLANT • SAN LEANDRO, CALIFORNIA • SALES AND SERVICE THROUGHOUT THE WORLD

NEWS, CONT. . .

velopment may have general use in industrial filtering. One possible use is to filter stack gases now causing fumes or smog in many regions. Such filters may also be used to filter ventilating air in biological laboratories and hospital buildings, especially in operating rooms.

Filter units consist of deep, closely spaced pleats of filter paper fitted into wooden frames. The pleats are spaced and kept in line by deformed separators of ordinary paper that hold them in place and permit easy passage of the air to be filtered. The paper pleats and separators are anchored into wooden frames with plastic adhesives. The frames are in turn glued and screwed at all corner joints to produce a perfectly tight assembly. Gaskets of soft sponge rubber cemented around the edges of the frames prevent air leaks when the frames are clamped into place.

## Maine to Educate Engineers For Pulp and Paper Industry

A new five-year course in pulp and paper technology will be offered at the University of Maine starting next fall, President Arthur A. Hauck announces.

The new program, which is an optional one in the department of chemical engineering, is specifically designed for young men interested in becoming qualified for positions in production. It does not replace the present four-year course nor the five-year curriculum which leads to the master of science degree.

Students taking the new five-year course will cover the usual requirements for the first three years of chemical engineering or equivalent preparation. The fourth and fifth years will include specialized courses in pulp and paper, and approximately an equal number of courses in economics, business and psychology.

The latter group of courses will include labor problems, personnel management, corporation finance, business law and marketing.

Those enrolled in the five-year course will be expected to devote at least two summers to working in industrial plants.

Satisfactory completion of the five-year program will lead to the B.S. degree and simultaneous award of a special certificate.

The program will be approved only for those students who appear to have aptitude and interest in management vocations. This decision will be based  
(Continued)

## News for Chemical Processors!



### A STEEL-BELT CONVEYOR THAT "FLOATS" ON A COOLING "RIVER"

**For Cooling Gelatin, Pitch, Grease, Synthetic Resin, Margarine, Meta-Silicate of Soda and for Heating or Cooling many other Chemicals.**

The new Sandvik Patented Water-Bed Conveyor carries your product on a solid, stainless-steel belt that is actually supported by water.

The top band of the continuous belt passes over a trough of circulating water. In operation, the water pressure is just enough to raise the belt off its supports. The surplus water overflows into gutters which collect and return the water for recirculation.

That means 100% coolant contact with the underside of the belt. Furthermore the entire conveying band runs in an air conditioned "tunnel" . . . a metal duct through which a suction fan pulls a continuous draught of clean, cool air. You get tremendous cooling capacity plus the strength, impermeability and resistance to heat, wear and corrosion inherent in the stainless steel belt.

Tapered rubber strips fitted to the edges of the flat, stainless belt hold the liquid chemical on the belt surface.

The width and length of the belt, speed of operation, temperature of the cooling or heating medium etc. all depend, of course, on the requirements of the individual application.

*Sandvik can design and build a steel-belt conveyor, with or without the Patented Water-bed arrangement, to fit your specific needs. Write for further information.*



SS-53



Inquire about Sandvik's small scale water-bed unit which is available for set up in your own plant to determine cooling rates and other data.

**SANDVIK STEEL, INC., Conveyor Department**

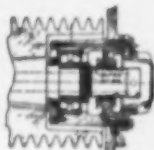
**111 Eighth Ave., New York 11, N. Y., Watkins 9-7180**

Manufacturers of Steel-Belt Conveyors for over 30 years

See Our Catalog  
in Sweets

GLOBE ROTO-CUT meat cutters are the standard of the Packing Industry. They produce better meat products at higher speed.

The Ball Bearing and the Spherical Roller Bearing on the cutter shaft of the GLOBE ROTO-CUT machine.



The  
Globe Company  
says:

**THIS LUBRICANT INCREASED  
BEARING LIFE FROM  
2 WEEKS TO 2 YEARS**

"After we had quite a few of our large high speed ROTO-CUT meat cutting machines in actual production operation, the ball and spherical roller bearings on the cutter shaft gave us serious trouble. Some bearings did not last even two weeks.

"In an effort to correct the difficulty, we contacted a number of the large lubricant manufacturers. We tried all the lubricants their engineers recommended without the slightest success. We checked with the manufacturers of the bearings who assured us that the bearings were not overloaded. The trouble was the condition that prevails throughout the meat packing industry, animal acids and moisture, a

combination most harmful to ball and roller bearings.

"Then, Ball Bearing LUBRIPLATE was called to our attention. The results we obtained from its use were most gratifying and amazing. We have had these ROTO-CUT machines lubricated with Ball Bearing LUBRIPLATE in continuous operation, twenty-four hours a day, three hundred days a year for over two years without a single bearing replacement. We now use LUBRIPLATE for factory lubrication and recommend it to our customers for use on practically all the equipment we manufacture."

THE GLOBE COMPANY  
Frank J. Bilek (Chief Engineer)

**YES, LUBRIPLATE LUBRICANTS ARE DIFFERENT!** They reduce friction, wear and power consumption... prevent rust and corrosion and last longer than ordinary lubricants. LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE product best for your every lubrication need. Write for case histories of the use of LUBRIPLATE in your industry.

**LUBRIPLATE DIVISION • Fiske Brothers Refining Company**  
Newark 5, New Jersey • Toledo 5, Ohio

DEALERS EVERYWHERE • SEE YOUR CLASSIFIED TELEPHONE BOOK

**LUBRIPLATE** the Modern Lubricant

NEWS, CONT.

on academic attainment and the results of certain tests.

Scholarships or fellowships from the recently established University of Maine Pulp and Paper Foundation will be available for some students who qualify for this program.

Representatives of the pulp and paper industry who are experienced in the duties of production and management will serve as an advisory committee in the administration of the program.

The course is open to young men already doing industrial work who are interested and can qualify.

Professor Lyle C. Jenness, head of the department of chemical engineering, is in charge of the program.

### Acid Chambers Blown Over; Fertilizer Making Goes On

Jackson Fertilizer Co.'s plant at Jackson, Miss., was hard hit by high winds recently. The sulphuric acid plant suffered heavily. Four of the acid chambers were blown to the ground, and the fifth was so shaken and damaged that it cannot be used though it is still standing. Albert A. Green, president and general manager, states, "We have not yet determined whether or not we will rebuild our acid plant."

The stock of superphosphate was about completed for the year, and the loss of the acid chambers at this time did not interfere with fertilizer production for the balance of the year as there are ample stocks of all materials on hand.

### Corning Glass Pushes Work On Unique New Pilot Plant

Construction has started at Corning, N. Y., on a new pilot plant, first of its kind in the industry, for Corning Glass Works, it is announced by H. K. Ferguson Co., industrial engineers and builders.

The pilot plant will be used to develop manufacturing processes from basic findings. Initial efforts will be concentrated on improving television bulbs, the glass enclosures for television tubes.

Although designated as a pilot plant, the new structure will be a complete manufacturing unit designed to test experimental production methods on a factory scale.

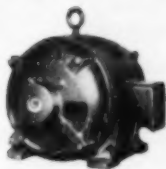
Of steel-frame and brick construction, the two-story plant will contain 51,000 sq. ft. and will be three times  
(Continued)

# Guard Against Atmospheric Hazards...

WITH

## Century

# PROTECTED MOTORS



Drip Proof



Splash Proof



Totally Enclosed Fan Cooled



Explosion Proof



### ALTERNATING CURRENT MOTORS

#### POLYPHASE

Squirrel Cage Induction—1/6 to 400 H.P.  
Wound Rotor Motors—1 to 400 H.P.  
Synchronous Motors—20 to 150 H.P.

#### SINGLE PHASE

Split Phase Induction—1/6, 1/4, 1/3 H.P.  
Capacitor—1/6 to 20 H.P.  
Repulsion Start, Brush Lifting, Induction—1/2 to 20 H.P.

### DIRECT CURRENT MOTORS

1/6 to 300 H.P.

### GENERATORS

AC, 63 to 250 KVA  
DC, 75 to 200 KW

### GEAR MOTORS

1/8 to 1-1/2 H.P.

### MOTOR GENERATOR SETS

AC to DC, AC to AC  
DC to DC, DC to AC

Open Protected, Splash Proof, Totally Enclosed Fan Cooled, Explosion Proof.

Ball Bearing motors are factory lubricated for several years' normal service. Bearing housing construction permits easy re-lubrication when unusual service demands it.

To guard your production against the destructive effects of atmospheric hazards, Century offers four types of protective motor frames.

**DRIP PROOF**—meets the requirements of most installations. Use it where operating conditions are relatively clean and dry. Top half of the frame is enclosed to keep out falling solids and dripping liquids.

**SPLASH PROOF**—keeps splashing liquids out of the motor even when the frame is washed with the full force of a hose. Use Century Splash Proof motors indoors or outdoors.

**TOTALLY ENCLOSED FAN COOLED**—resists the hazards of abnormal concentrations of dusts, powders, grit, oil mists, acid and alkali fumes.

**EXPLOSION PROOF**—protects life and property in atmospheres charged with explosive dusts or vapors.

The properly selected protection with the wide variation of starting torque characteristics to choose from provides long operating life and improves the production of the driven equipment.

Century motors are available in a wide range of kinds and types—in sizes from 1/8 to 400 horsepower—for single phase, polyphase and direct current applications.

Specify Century motors for all your electric power requirements.

**CENTURY ELECTRIC CO.** 1806 Pine St. • St. Louis 3, Mo.

Offices and Stock Points in Principal Cities



**WHICH  
DUST  
PROBLEM**  
can you turn  
into



**PROFIT**

with **PANGBORN DUST CONTROL?**

**VALUABLE DUST ...**

Some dusts are valuable! Dust from packing, transporting or processing raw materials or products can be *salvaged at a profit* by Pangborn Dust Control. For instance, one of America's largest chemical plants reports that on a yearly basis, their Pangborn Dust Control system recovers \$14,859 worth of valuable chemicals!

**HAZARDOUS DUST ...**



Dust can be extremely dangerous! In certain concentrations, dust is actually more explosive than gasoline. With Pangborn Dust Control you can reduce explosive dust hazards, earn lower insurance rates, run less risk of damage to your plant. In the coal field alone, scores of processors rely on Pangborn Dust Control to protect their property!

**BOTHERSOME DUST ...**



Dust costs you money! Dust makes walls dirty, gets into bearings and machinery, sends maintenance costs sky high! But with Pangborn Dust Control, housekeeping problems are solved *at a profit*. One well-known rubber company recently said: "We save over \$1200 a year with Pangborn Dust Control, even though dust has *no salvage value!*"

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning. For full data on Pangborn Dust Control for your plant, write for Bulletin 909-A. Address: PANGBORN CORPORATION, 283 Pangborn Blvd., Hagerstown, Maryland.



**STOP THE DUST HOG**  
from stealing profits with

**Pangborn**

**DUST CONTROL**

NEWS, cont. . .

as large as the pilot plant that the company put into operation in 1946. The 1946 pilot plant will continue to work on laboratory and experimental projects.

Built to meet expanded needs of the television industry and to enable Corning to maintain its competitive position in the glass industry, the new pilot plant will employ approximately 100 persons. Completion is expected late this summer.

A 60-ton glass melting tank will be housed in a separate structure at the rear of the plant.

**Phosphate Chemicals Coming From New Plant in Florida**

International Minerals & Chemical Corp., in a major diversification move, is entering an entirely new field, that of phosphate chemicals. As part of a \$4 million expansion program, one of the most important ever undertaken in Florida's Polk County phosphate fields, International will build a new plant for the manufacture of multiple superphosphate and phosphate chemicals, including dicalcium phosphate for animal feed and chemical purposes.

Also planned is construction of a new large sulphuric acid plant.

Other phases of International's expansion program call for: construction of an analytical laboratory for the company's Phosphate Division; a modern machine shop, warehouse and service center at the Noralyn mine to serve all of International's Florida operations; and a new headquarters office building on a 60-acre tract just south of Bartow's city limits.

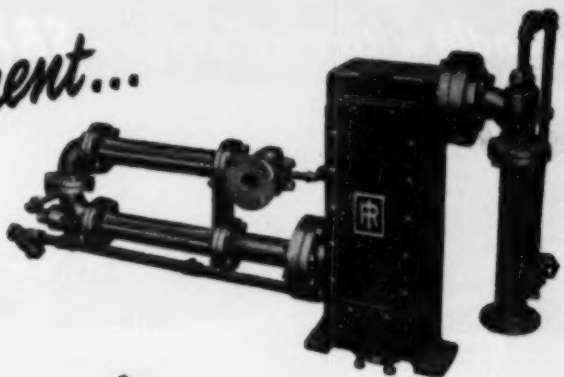
The expansion, according to President Louis Ware, is International's answer to mounting costs of production and operation and to highly competitive sales problems. The new program will help maintain employment levels in Bartow. It will afford a more consistent source of revenue to the area both through wages for employment and from the sale of the products developed there.

**Shamrock Adding Cat Cracker To Boost Gasoline Output**

Shamrock Oil & Gas Corp. will install a Houdrillow catalytic cracking unit at its McKee Refinery near Sunray, Tex., J. H. Dunn, president of the corporation, has announced. The new unit will have a design fresh charge capacity of 5,900 bbl. per stream day. (Continued)



*The correct  
Vacuum Equipment...*



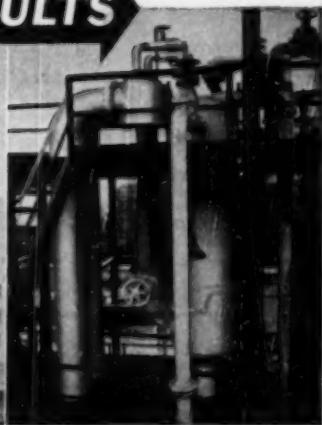
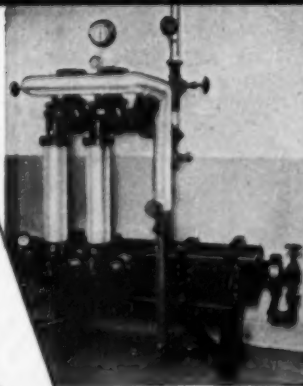
*...properly  
applied  
by Ingersoll-Rand*

To be sure of the most effective results when you're planning on new vacuum equipment, you'll want to know what an Ingersoll-Rand engineer has to say about it. The correct application of ejector equipment can make the difference between an effective installation and one that is costly and inefficient. That's why you will benefit by calling in an Ingersoll-Rand engineer. He will be glad to work with you and give you the advantage of his years of experience with all kinds of vacuum installations.

**PRODUCES EFFECTIVE RESULTS**

**FOR VACUUM EQUIPMENT  
Specify I-R**

- Steam-jet ejectors
- Reciprocating dry vacuum pumps
- Barometric condensers
- Ejector-jet condensers
- Surface condensers
- Vacuum Refrigeration



**Ingersoll-Rand**

11 BROADWAY, NEW YORK 4, N. Y.

**"Handle with care" cargo — SAFE**



Sulphuric acid barge, capacity 800 tons, built by Ingalls for the General Chemical Corporation. Length 175', width 26', depth 10'6".

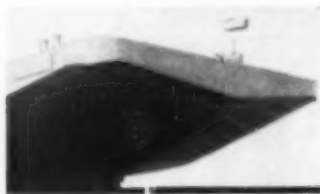
## IN INGALLS-BUILT BARGES

Chemicals or coal, petroleum or pineapples, Ingalls-built barges carry the product safely, faster, economically, with a minimum of maintenance cost. The sulphuric acid barge shown above typifies the specialized type of craft we build for leading operators everywhere, to their specifications or ours.

Whatever your barge requirements—standard or special, single or integrated—figure with Ingalls first. Our years of experience and two conveniently located shipyards can save you time, trouble and money. Inquiries answered promptly.

### AMAZING NEW BOW

The INGALLS IMPROVED BOW is setting records for speed and better performance. Write for details of how this amazing new bow will help you earn greater profits.



THE INGALLS SHIPBUILDING CORP.

MAIN OFFICE: BIRMINGHAM, ALA.

Sales offices in New York, Chicago,  
Pittsburgh, New Orleans.

Shipyards at Pascagoula, Miss.,  
and Decatur, Ala.

**INGALLS**  
*Barges*

**BARGES—SINGLE & INTEGRATED • WORKBOATS  
TOWBOATS • SHIPS & SHIP CONVERSIONS • REPAIRS**

NEWS, cont. . .

with additional capacity to permit recycling for increased gasoline production.

Construction will be handled by the Catalytic Construction Co. of Philadelphia and will proceed immediately. Completion is expected by early next year.

### Steel Industry Millions Go To Keep Streams Unpolluted

The steel industry spends about \$10 million annually in keeping clean the streams it uses. In addition, the industry has more than \$10 million invested in equipment to purify its major waste liquid, "used pickle liquor."

Pickle liquor is an acid bath used to remove oxide scale from such products as black plate for tinning, wire, sheet and strip. Recognizing that streams must function for public health, drainage, navigation and recreation, the steel industry renders harmless before disposal most of the 600 million gallons of pickle liquor used each year. This compares with 6 billion gallons of community sewage released to the nation's waterways daily, 40 percent of which is not chemically treated.

Dust catchers, and in some cases electronic precipitators, are used to control flue dust from blast furnaces. This expensive equipment is effective in keeping solids from being carried into streams with waste cooling water.

Waste from coke ovens contains phenol. Steel plants frequently use the phenolic waste water from coke plants to quench hot coke after it is pushed from the ovens, thus keeping the phenol from the streams.

Escape of oil from steel plants into streams is eliminated by preventive measures within the mills, involving in some cases the installation of an oil skimmer.

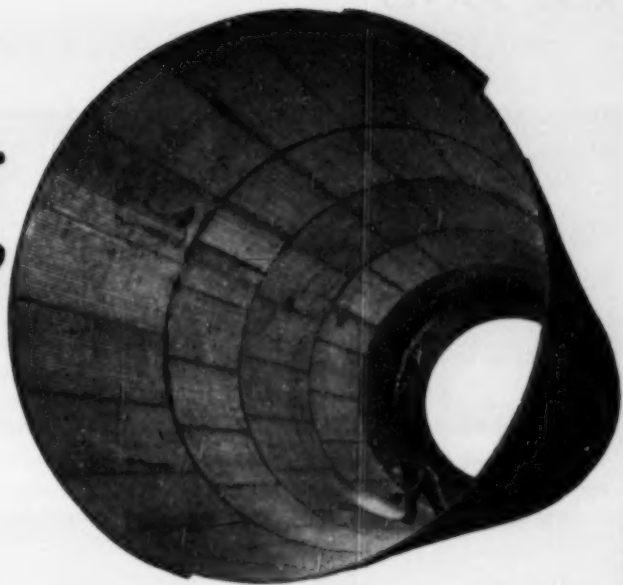
There is, as yet, little or no financial return on the investment the steel industry has made in helping to prevent stream pollution.

### Jesdale New President of New England Chemical Club

The Chemical Club of New England held its annual meeting at the Parker House in Boston, Mass., recently. The following slate of officers was elected for this year: Thornton C. Jesdale, Monsanto Chemical Co., president; David J. O'Connell, Howe & French, Inc., vice president;

(Continued)

**Worried about  
HCl corrosion?**



## **Let MONEL help you keep costs down**

Many years of service experience backed by extensive research, have shown that Monel® has satisfactory resistance to destructive corrosion by hydrogen chloride and hydrochloric acid.

In applications where low concentrations of hydrochloric acid must be handled regularly, Monel vessels and processing equipment have given outstanding service. In petroleum refining, for example, Monel-lined fractionating columns, tanks, and Monel piping and fittings have substantially outlasted other metals.

In addition, Monel is an excellent structural material, possessing high strength, and good workability. Monel can be welded to form corrosion-resistant joints; can be machined, formed, and bent with ordinary shop tools and methods.

Monel is available in all standard mill forms, including seamless tubing and Monel-Clad Steel sheet and plates.

If you have corrosion problems and are looking for ways to preserve product purity or cut maintenance expense, you are invited to consult our Corrosion Engineering Service. Write, explaining your difficulties, and we will put at your disposal a vast accumulation of research and experience data.

Monel-lined top section of a large fractionating column. Made by the A. O. Smith Corporation for one of the nation's largest oil refiners.



Monel-lined tanks installed at the plant of a large Southern oil refiner. Tanks are lined with Monel to combat corrosive action of dilute hydrochloric acid.

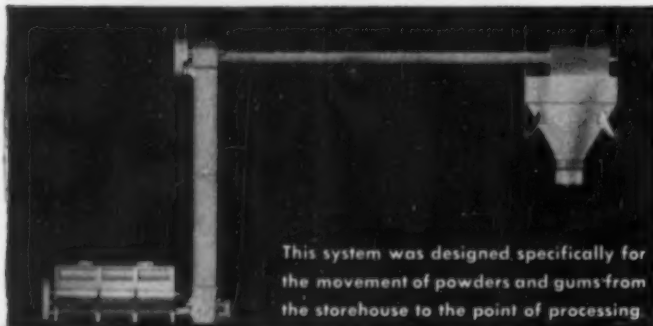
The tanks were fabricated by Wyatt Metal & Boiler Works, Houston, Texas.

EMBLEM OF SERVICE  
**NICKEL INCO ALLOYS**  
TRADE MARK

MONEL • "K" MONEL • "S" MONEL • "KR" MONEL  
MONEL • NICKEL • "D" NICKEL • "L" NICKEL  
INCONEL • DURANICKEL • PERMANICKEL  
INCONEL "X"

**THE INTERNATIONAL NICKEL COMPANY, INC.**  
67 Wall Street, New York 5, N. Y.

## READ SOLVES MATERIAL HANDLING PROBLEM



This system was designed specifically for the movement of powders and gums from the storehouse to the point of processing.

The above Read Material Handling System was engineered and built for a New York chemical company that manufactures adhesives.



PLAIN DUMP BIN



SCREW CONVEYOR

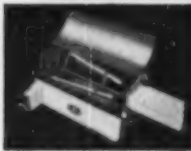


BUCKET ELEVATOR

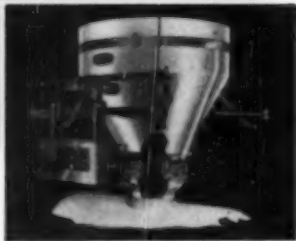
Complete Read Material Handling Systems are "tailored" to meet your particular material and plant requirements. Each system is carefully designed with an eye to lowering processing costs by preventing the loss of material in handling and increasing the efficiency of your overall operation.

In addition, each unit in a Read System is designed and constructed for easy accessibility and cleaning—your assurance of maximum equipment sanitation in your plant.

For a material handling system tailored to solve your particular problems, contact Read. One of our engineers will be glad to study your plant operation and make recommendations without obligation.



CONE SIFTER



WEIGH HOPPER

# READ

**READ MACHINERY DIVISION**  
of The Standard Stoker Company, Inc.  
YORK 1, PENNSYLVANIA

News, cont. . .

Edward C. Richardson, U. S. Industrial Chemicals, Inc., treasurer; and Richard D. Wilson, Doe & Ingalls, Inc., secretary. Howard J. Heffeman, Monsanto Chemical Co., was appointed to the executive board for three years.

The club was founded on Oct. 29, 1945. It is comprised of men associated with the chemical industry of New England.

### Big-Hearted Chemical Firms Respond to Educator's Plea

Morton Zerder, chairman of the chemistry department of Walter Hervey Junior College in Manhattan, needed equipment desperately. But his limited budget wouldn't provide all of the items. So he sat down and wrote a plea to over 50 chemical firms.

The answer came in the form of books, supplies and equipment. Zerder, now thoroughly convinced that industry does cooperate with educators, has been busy writing thank-you notes to the following firms: Diamond Alkali Co., Popper & Sons, Sparkler Manufacturing Co., Eriez Manufacturing Co., Blaw-Knox Manufacturing Co., United States Steel, Mine Safety Appliances Co., Palo-Myers, Inc., Sarco Co., Inc., Illinois Testing Co. and Esso Standard Oil Co. And Zerder's students are now hard at work in their new laboratory.

### Monsanto Plans to Construct Huge Phosphorus Furnace

Plans to construct the sixth electric furnace at Monsanto, Tenn., for the production of elemental phosphorus are announced by the Monsanto Chemical Co.

The new furnace, which will have a capacity of 25,000 kw., will be the largest phosphorus furnace in the world and one of the largest electric furnaces ever built.

J. L. Christian of St. Louis, general manager of Monsanto's Phosphate Division, states that the new furnace is being constructed "to bring about a sizable increase in the production of phosphorus." The fifth furnace was completed at this location in October 1948. The new furnace is expected to be completed during January 1951.

Additional expansion of the Phosphate Division's plant at Trenton, Mich., also is announced. The facilities there for the production of sodium and ammonium phosphates will be expanded. Facilities at the division's Carondelet, Mo., plant for the pro-

(Continued)



For nearly fifty years Metal & Thermit has specialized in the development and production of tin and tin chemicals. The M & T trade mark has almost become another symbol for tin.

In addition to supplying a widely diversified list of both organic and inorganic tin chemicals to the plating, plastics, ceramics, soap, textile and petroleum industries, M & T maintains a continuous research program for the development of new chemicals to meet specific industrial needs.

One example is STANNOCHLOR — stannous chloride in its most concentrated, most stable, most adaptable form.

If tin in any form can provide the answer to your processing needs or product improvement, we invite your inquiry.

**METAL & THERMIT CORPORATION**

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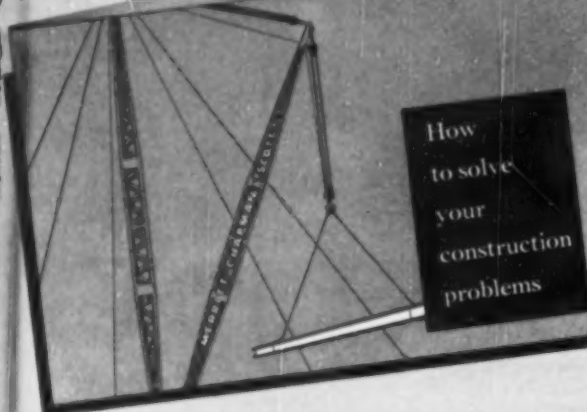
*Specialists in Tin*



OFFICE OF THE PRESIDENT

WH-

*This new M-C & S booklet  
should help us with  
our construction plans.  
Suggest you write for it.  
Jim*



### *Your copy sent upon request!*

Simplest, surest way to solve your building problems is to select a construction organization fully qualified as to experience, personnel, adaptability, financial responsibility and reputation. This new illustrated booklet will ease your task of making the right selection. It presents a factual record of M-C & S's ability to solve intricate construction problems in minimum time with maximum economy. Whatever your project—a new plant, addition or the installation of new process equipment without work interruption—you will benefit by writing for this new M-C & S brochure. It will be sent immediately upon request to Dept. CE.

## **MERRITT-CHAPMAN & SCOTT** CORPORATION

Founded in 1860... now in our 90th year

**GENERAL OFFICES**

**17 Battery Place, New York 4, N. Y.**

CLEVELAND • BOSTON • NEW LONDON • PASADENA, TEXAS



News, cont. . .

duction of calcium phosphates also will be enlarged.

The Monsanto plant in Tennessee is the largest producer of elemental phosphorus in the world. It was started in 1936, when the operation was transferred from Anniston, Ala. The work consists of mining and processing phosphate rock and converting it into yellow phosphorus. The phosphorus produced is better than 99.9 percent pure.

Because phosphorus bursts into flame when brought into contact with air, the product must be kept under water. It is stored at the plant in underground tanks and shipped in tank cars under a protective layer of water. It is transported in this manner to plants at Monsanto, Ill., and Trenton, Mich. At these locations it is converted into phosphoric acid and phosphate compounds for use in heavy industry and in the manufacture of such products in common use as baking powder, self-rising flour, dentifrices, medicinals, detergents and water-softeners.

### **Metalloy Expands Facilities For Lithium Processing**

A plant reconstruction and expansion program has been completed by the Metalloy Corp. of Minneapolis, Minn., a division of the Lithium Corp. of America. Increased plant facilities and the latest in extracting and processing equipment were major phases of the over-all plan.

Purpose of the extensive rebuilding program was twofold: (1) to solve the pressing need for added plant space; and (2) to meet the demand for more modern machinery with faster output. The rapidly spreading industrial uses for lithium, as well as the partial damage to existing plant facilities caused by fire, necessitated the work. Plant operation is now on regular production schedules.

Metalloy's new production potential is considered an important step in meeting increased demands for both lithium metal and compounds by consuming industries.

### **Thioglycolic Acid and Salts To Come From New Plant**

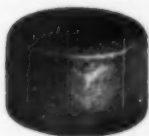
Halby Chemical Co., Inc., is constructing in Wilmington, Del., a plant for the manufacture of thioglycolic acid and its salts. Initial operation will be limited to the production of ammonium thioglycolate of cosmetic (Continued)



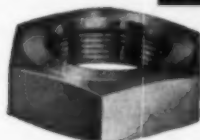
**Toothed Lock Washer:** Prevents loss of stem nut due to vibration, thereby holding the handwheel securely.



**Newly Designed Handwheel:** Air-cooled, finger grip handwheel affords sure grip even with greasy gloves.



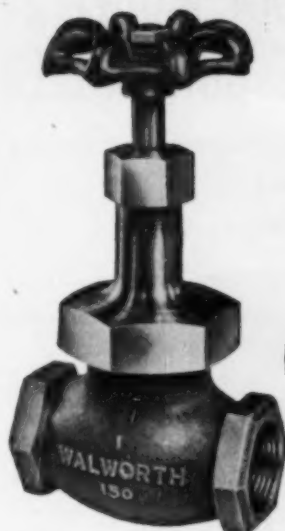
**Improved Packing:** Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure.



**Hexagonal Union Bonnet Connection:** Eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and assembled.



**New Cylindrical Disc Holder:** The design of the top portion of the disc holder keeps the disc accurately guided under all operating conditions.



**WALWORTH**

**IMPROVED  
No. 95  
BRONZE  
GLOBE VALVE**

also available in  
Angle Type (No. 96)

The service ratings of the Walworth No. 95 are 150 pounds per square inch steam at 500F, and 300 pounds per square inch non-shock cold water, oil, and gas. In the manufacture of this quality bronze valve, more than 47 gages are used in machining parts to micrometric accuracy, thus insuring interchangeability of parts. For further information see your local Walworth distributor, or write: Walworth Company, 60 East 42nd St., New York 17, N. Y.

*note these 7 Great Features*

**WALWORTH  
valves and fittings**

60 EAST 42ND STREET

NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



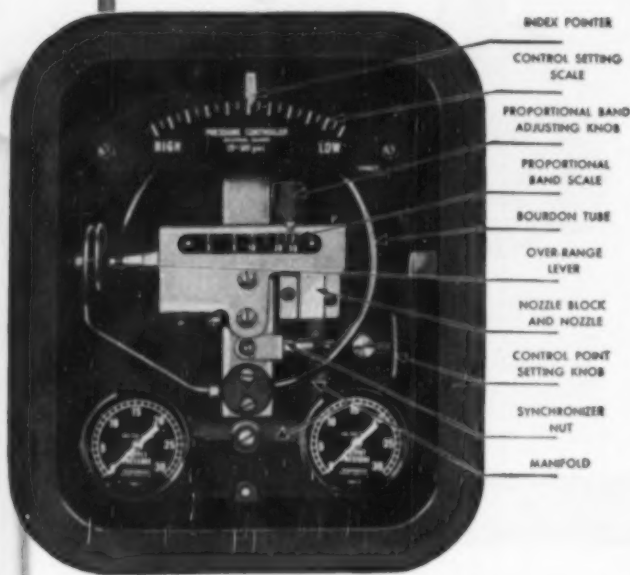
**Renewable Asbestos Disc:** This disc is suitable for steam up to 500F and is resistant to oil, gasoline, and many chemicals at atmospheric temperatures. Discs for special services are available.



**Extra Strong Body:** Made of Composition M (ASTM 861) bronze thick enough to provide a high safety factor. Valves undergo hydrostatic shell test of 450 psi.

# MASONEILAN MODEL 2700 PRESSURE CONTROLLER

**Offers Accurate Proportional Control...  
Precise Response...  
Ease of Adjustment...**



INDEX POINTER

CONTROL SETTING  
SCALE

PROPORTIONAL BAND  
ADJUSTING KNOB

PROPORTIONAL  
BAND SCALE

BOURDON TUBE

OVER RANGE  
LEVER

NOZZLE BLOCK  
AND NOZZLE

CONTROL POINT  
SETTING KNOB

SYNCHRONIZER  
NUT

MANIFOLD

## ...YET IS MODERATELY PRICED

Masoneilan No. 2700 Pressure Controllers are especially designed for applications requiring accurate control when expensive instruments are not warranted. The pneumatic feedback, usually found only in more elaborate proportional controllers, assures precise response. The Control point setting mechanism provides accuracy of adjustment and easily read expanded index scale. Control action is reversible with either bourdon or bellows. The controllers are furnished in two case styles: a universal case for panel mounting; and a specially designed case for valve or wall surface mounting.

Applications include — pump governors, steam pressure reducing stations, gas well pressure reduction, and many others requiring small to intermediate proportional band.



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Detroit • Charlotte, N. C. Mason-Neilan Regulator Co., Ltd., Montreal and Toronto

NEWS, cont. . .

grade, for which rated plant capacity will be 1 ton per day.

Progress in construction has permitted operation of the synthesis equipment producing crude thioglycolic acid solution. Erection of the neutralization and purification equipment is just being completed. Performance of the synthesis equipment, in the trial operation, was entirely satisfactory. In general, production of thioglycolic acid in commercial scale equipment is much more difficult than in the laboratory due to the tendency toward low yields and poor quality of product.

### Champion Steps up Output Of Paper at Texas Mill

Champion Paper & Fibre Co. has greatly increased the paper production capacity of its mill at Pasadena, Tex. Two of the paper machines that have been installed recently in this mill were transferred here from the company's mill in Ohio.

A new paper machine developed by the company's research and engineering department produces high-quality machine-coated grades at speeds up to 1,200 ft. per min. A sheet of paper trimming to 135 in. is made on this new machine. These three additional machines will give the Pasadena mill a capacity of 350 tons a day.

### Arkansas Refinery Boosts Capacity With New Units

A 30,000-bbl. a day increase in refinery crude oil capacity will result from Pan-Am Southern Corp.'s new construction at its El Dorado, Ark., refinery. The contract was awarded to Foster Wheeler Corp. Work on the new construction begins this month and should be completed within a year. There will be a second fluid catalytic cracking and vapor recovery unit in addition to a new coking unit now 35 percent complete. The new construction will increase capacity of the refinery 20 percent, raising output to 16,500 bbl. of motor gasoline daily.

### Deresining Unit Being Added To Pennzoil's Lube Plant

Contract for a propane-deresining and resin-fractionating unit at its present lube oil plant at Rouseville, Pa., has been awarded by the Pennzoil Co. to the M. W. Kellogg Co. of Jersey City, N. J. The unit will be designed

(Continued)



## *It's the Nash!*

Nash Compressors in your plant can automatically increase the capacity of your absorption equipment, for with the Nash it is possible to secure absorption directly in the pump.

This is due to the Nash liquid compressant operating principle, involving a fluid vortex through which the gas must pass in the process of compression. To absorb from a gas, simply flow absorbent through the compressor as the compressing medium. In this close contact of liquid and gas, the desired fractions are picked up and retained by the absorbent. This in no way impairs efficiency as a compressor.

This useful stunt is made possible by the fact that slugs of liquid entering a Nash Compressor do no harm to the pump structure. Nash pumps have only one internal moving part, simple, non-wearing, and employ no gas contaminating internal lubrication. There are no valves, gears, pistons, or sliding vanes, and original pump efficiency is maintained over a long life. In a single stage Nash Compressors produce 75 lbs. pressure or vacuums to 26 in. of mercury, with capacities up to 6 million cubic feet per day in a single structure. Investigate these pumps now.

- One moving part.
- No internal wearing parts.
- No valves, pistons, or sliding vanes.
- No internal lubrication.
- Low maintenance.
- Slugs of liquid entering pump do no harm.
- Original performance constant over a long pump life.
- Non-pulsating pressure.
- Saves floor space.
- 75 pounds in a single stage.

# **NASH**

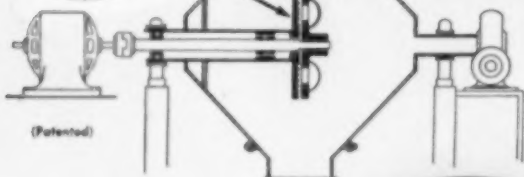
## **ENGINEERING COMPANY**

**304 WILSON, SO. NORWALK, CONN.**

# G·R·I·N·D·S *as it Mixes!*

**RUBBING  
DISCS**

**GRINDING  
plus  
TUMBLING**



When "drastic action" is needed the MUENCH Mixer delivers the goods. Materials of any strength can be extended to varying standards through extenders of various types to a complete blend where every particle, regardless of character, is evenly rubbed together and mixed many times.

While basically the GEMCO Blender, this MUENCH Mixer embodies Patented interior rubbing discs, which grind and abrade the material constantly while it is being tumbled . . . blends more effectively and increases the degree of perfection. More is accomplished with less handling; its versatility allows various products to be ground, mixed and weighed with but a single handling. No other blender can duplicate the results of the MUENCH Mixer . . . Arrange for a FREE TEST RUN of your materials . . . and we'll prove it!

*The*  
**MUENCH**  
*Mixer*  
for the highest degree  
of perfection in  
dry blending

## *Advantages:*

**UNIFORM** particle dispersion and thorough blending of dry materials, powder or granules, before or after pulverizing, in one operation.

**RAPID**, smooth, vibration-free operation. (Totally enclosed worm gear drive.)

**ECONOMICAL**, very low power consumption, minimum maintenance.

**CLEAN** . . . Conical shaped blender permits 100% emptying, without dud, and with minimum chances of contamination. Easy to clean. No baffles.

**ONE-MAN OPERATION** . . . Push-button simplicity.

**SAFE** . . . Minimum "occupational hazards for workers."

**SELF-CONTAINED**, precision built, assembled and inspected carefully in our plant. (Motor is built into unit.)

**CAPACITY** . . . Blends batches up to 25,000 pounds.

**IT EMPLOYS** that GEMCO Spherical dust-tite valve, that makes for easy loading and discharging. "Works like a charm."

**"Solved our  
most difficult  
problem . . ."**

We quote from Mr. Jack Strong, Plant Manager, the Eagle-Picher Company, Newark, N. J., "The Conical MUENCH Mixer solved our most difficult problem in mixing heavy material with light material when all previous methods had failed."

**Write us . . . we can help you!**

## General Machine Company of New Jersey

Established 1918

SPECIAL CHEMICAL AND MIXING MACHINERY • SPHERICAL VALVES

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News, cont. . .

to charge 1,370 bbl. of Pennsylvania reduced crude each day, and is scheduled for completion late this year.

Products will include light-colored, low carbon-residue deresined oil, which will be further processed for the manufacture of high quality lubricating oils, and three resin fractions of exceptionally high viscosity, which are expected to find markets as specialty products.

Estimated cost of the project is \$800,000 for materials and \$200,000 for labor. Justification of the expenditure for the new plant is based upon operating cost savings to be made in finishing high quality bright stock and increased neutral oil production, but it is expected that the sale of the resin fractions will also add appreciably to the return on the plant. Some new design features not previously used in plants of this type will give flexibility in controlling the quantity and quality of the different products made.

## BRIEFS . . .

**Kolker Chemical Works of Newark, N. J.**, has purchased a 25-acre plant site on the north side of the Houston Ship Channel, Houston, Tex., from Diamond Alkali Co. Kolker will move its DDT, 2,4-D and other chemical operations from Newark to Houston. Chlorine will be supplied by Diamond. Construction is expected to start in six months.

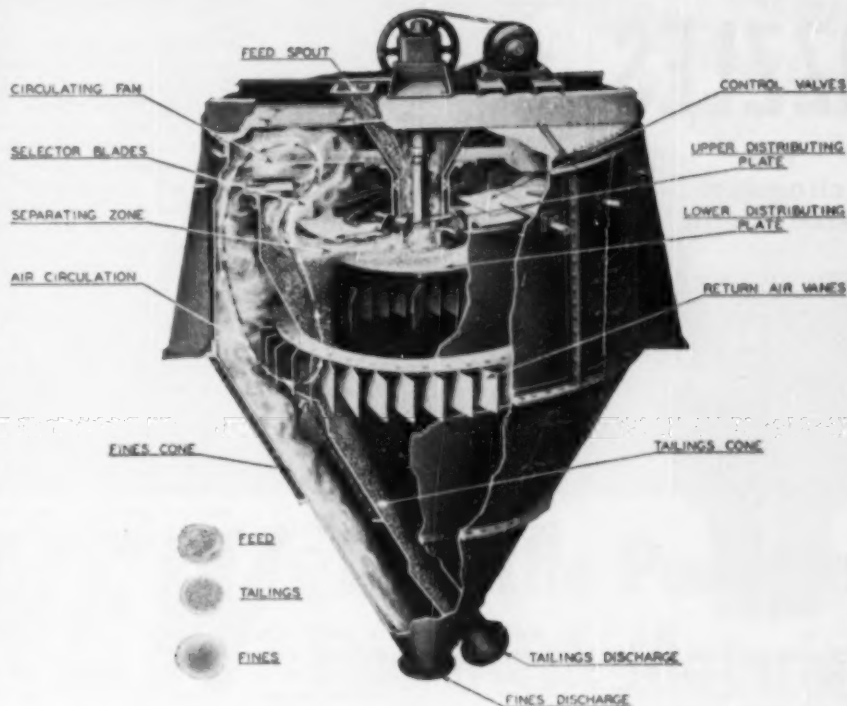
**Arkansas Fertilizer Co.**, North Little Rock, has commenced operations at its new plant. Products include 40 insecticides and fungicides. The sulphur used in the manufacturing operations comes from plants of the parent company, Mathieson Chemical Corp., at Stamps and McKamie in Lafayette County. It is recovered from sour natural gas.

**American Enka Corp.** will expand its rayon plants at Lowland, Tenn., and Enka, N. C., at a cost of \$8.75 million. Work will start at Lowland soon, with further expansions at Lowland and Enka slated for the end of the year.

**Harris Research Laboratories** of Washington, D. C., has granted Alexander Smith & Sons Carpet Co. exclusive license to install the new Harris color stripping process in all branches of the wool processing industry.

—End





# Here's How-

## STURTEVANT AIR SEPARATORS

**Produce accurate fines with increased output up to 300%**

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected... that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300%

... lower power costs by 10% to 50%... reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.



### RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

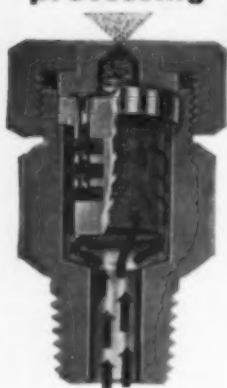
## STURTEVANT MILL COMPANY

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Designers and Manufacturers of  
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS  
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

# SPRAY NOZZLES

for  
chemical  
processing



The NEW Binks Series 12 Nozzle illustrated above is only one of a complete line of Binks Industrial Spray Nozzles now available in a wide choice of materials for applications involving...

oxidation  
evaporation  
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## READERS' VIEWS AND COMMENTS

### Chamber Acid Costs

To the Editor:

Sir:—We have read Mr. James A. Barr's article on sulphuric acid production by the chamber and contact processes in the April issue of *Chemical Engineering*. His construction and conversion cost estimates for Mills-Packard chamber plants are higher than current prices being quoted by us for complete new plants.

Using the same basis as Mr. Barr, Mills-Packard chamber plants will cost

Plant Capacity Tons per Day 100% Acid	Construction Costs Harte	Barr
25	\$165,000	\$325,000
50	275,000	400,000
100	370,000	500,000
200	490,000	600,000

Based on year-round production at rated capacity, the conversion cost per ton of 100 percent acid, in Mills-Packard chamber plants, using the same data as Mr. Barr, is estimated to be

Plant Capacity Tons per Day 100% Acid	Conversion Cost per Ton 100% Acid Harte	Barr
25	\$4.30	\$4.64
50	3.33	3.71
100	2.58	2.70
200	1.99	2.11

We have no data on construction and conversion costs on contact plants and cannot draw any conclusions as to whether the Mills-Packard or contact acid plant produces acid at a lower cost for a given tonnage. However, using the data on contact plants in Mr. Barr's article, it appears that the contact plant may possibly produce acid cheaper than the Mills-Packard plant when rated capacity is 125 tons or more per day of 100% acid.

The construction and conversion cost for Mills-Packard chamber plants varies with the price of lead. We suggest that manufacturers obtain complete cost information on both the chamber and contact plants when they need additional production capacity. With this up-to-the-minute data, they can determine which plant will produce acid at a lower cost.

D. M. WEATHERLY

John J. Harte Co.  
Atlanta, Georgia.

### Unreliable Data

To the Editor:

Sir:—In "Plant Notebook" for January 1950 there is an item by J. I. Hogan (p. 121) on using Chauvenet's criterion for rejecting "unreliable" experimental data, and on using the probable error as an index of precision. Neither of these concepts is now

being used in accepted statistical practice.

One obvious objection to Chauvenet's criterion is that it assumes that the observations will be distributed according to the normal error law which certainly is not true of all experimental data. Even if the universe of data were so distributed, the normal law is not suited for small samples of less than say 30 observations. One fairly recent book, whose authors are not statisticians, which presents Chauvenet's criterion is A. G. Worthing and J. Geffner's "Treatment of Experimental Data," John Wiley & Sons (New York, 1943). The inclusion of this material was strongly criticized by F. W. Powers in his review published in *Chem. Eng. News* 22, 1508-9 (Sept. 10, 1944).

Another common concept that is similar to Chauvenet's criterion is to take the best two out of three results. It has been shown both mathematically and practically (see National Bureau of Standards Technical News Bulletin, "The Fallacy of the Best Two Out of Three," 33, 77-8, July 1949) that more often than not the rejection of the datum which differs appreciably more from either of the two "good" data than they do from each other leads to a less accurate average than using the three data points together does.

As pointed out by R. H. Bacon in "Practical Statistics for Practical Physicists" on p. 94 of *Am. J. Physics* 14, 84-98 (1946): "As for possible errors of measurement, data should not be rejected for statistical reasons alone; data should be rejected only when they can be impeached for valid physical reasons." Consequently unless there is good evidence that the equipment was out of control or not operating at specified conditions all data should be retained. The logical alternative to the questionable rejection of "unreliable" data is to make additional observations so that the average is not unduly influenced by any single result.

STUART T. HADDEN

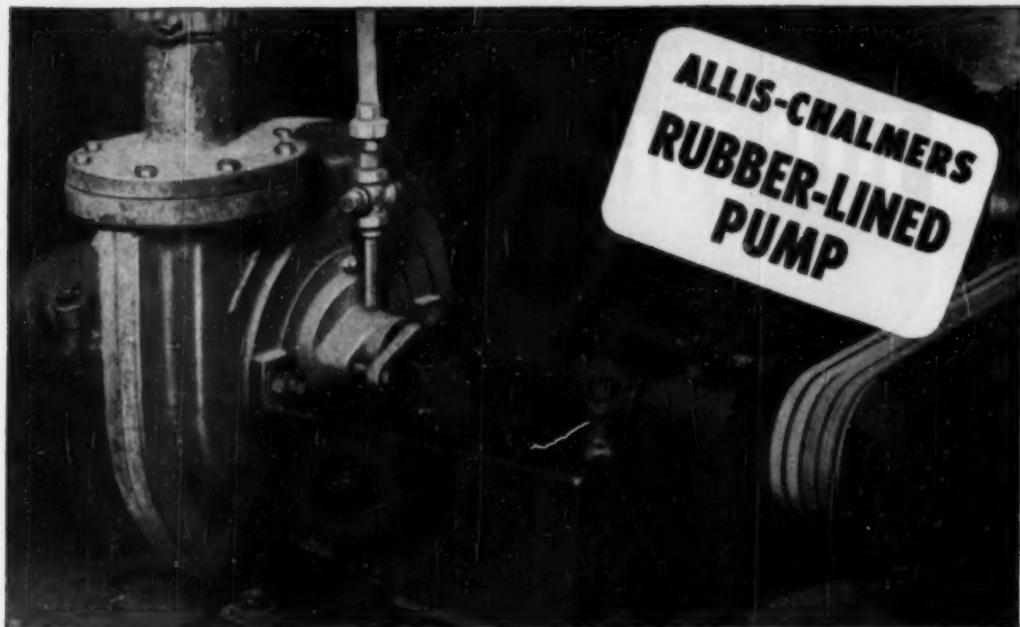
Research and Development Dept.  
Socony-Vacuum Laboratories  
Paulsboro, N. J.

### The Breaks

To the Editor:

Sir:—I am quite interested in the article "How to Reject Unreliable Data by Statistical Selection," appearing in the January 1950 issue of *Chemical Engineering*.

(Continued)



## ALLIS-CHALMERS RUBBER-LINED PUMP

# NEW Long Life Pump for Fine Mesh Materials

FOR MANY APPLICATIONS this new Allis-Chalmers Rubber Lined Centrifugal Pump offers great economies over both standard and special types of metal pumps. It is especially effective for handling difficult fine mesh materials ( $\frac{1}{8}$ " to 325 mesh) such as sand slurries, slimes and muds, tailings, concentrates and similar substances.

### GREATER ABRASION RESISTANCE


The rubber lining offers as much as fifteen times the resistance to abrasion that the hardest special metals offer. The lining is formed around a steel skeleton which allows close control of the properties of the rubber. The lining is then secured in the casing. This unique method provides a mechanically strong and rigid lining which is not subject to "sand blistering."

### ADAPTABLE TO YOUR NEEDS

Many different rubber compounds are available to provide longest life in your particular application. A wide range of sizes covers almost every need and, in addition, the capacity is variable by simply changing the speed of the impeller through the *Texrope* V-belt drive. *Vari-Pitch* Automatic Sheave drive provides instant speed changes.

Find out how this new Allis-Chalmers Rubber-Lined pump can save money for you. Ask your nearest A-C Sales Office or send in the coupon today.

*Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.



### Send For Free Bulletin

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Please send me Bulletin 08B7311 describing the  
new Allis-Chalmers Rubber Lined Centrifugal Pump.

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# ALLIS-CHALMERS





Eastern Centrifugal Pumps are CLOSE-COUPLED and available in SPECIAL METALS. Over 100 models to choose from to pump from 0-70 psi, 0-70 gpm. Economical and trouble free.

FOR EASTERN'S NEW CENTRIFUGAL CATALOG 100, WRITE TO DEPT. AC

**Eastern Industries Inc.**  
296 Elm St., New Haven, Conn.

## BEST DEFENSE AGAINST FIRE

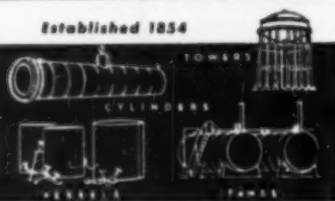
For water when you need it, you can't beat an elevated tank. Backed by 85 years' experience in tank design and fabrication, you can rely on COLE tanks to meet most insurance requirements and ASME standards, and to provide you with an extra margin of safety.

Whether you desire a tank of 5,000 or 1,000,000 gallons—Cole engineers will give you the right design for the specifications. Write for the latest Cole catalog—"Tank Talk."



**R.D. COLE**  
MANUFACTURING CO.  
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Established 1854



### READERS' VIEWS, cont. . .

Apparently the values of the Factor  $K$  should give a continuous curve. However, observation of Table I reveals several breaks, a pronounced one at  $n = 8$  and minor breaks for  $n = 17$  and  $n = 21$ .

May I please have the basis for these discontinuities?

ROBERT G. JAMES

Engineering Department  
Dayton Scale Division  
The Hobart Manufacturing Co.  
Dayton, Ohio

NOTE: Author Hogan says the value of  $K$  for  $n = 8$  is 2.88. The printed value is incorrect and as such is due to an error of interpolation of the probability tables employed. The discontinuities at  $n = 17$  and  $n = 21$  are consistent with the conditions as set forth in Chauvenet's Criterion.—EDITOR.

### Editorial Amnesia

To the Editor:

Sir:—While the November contest prize-winning suggestion by Harold F. Reichard should be of considerable interest to everyone not already familiar with this method of unloading liquids from tank cars, additional economy can be exercised by bringing the tank car back to approximately atmospheric pressure for return shipment, especially where handling higher molecular weight low boilers, by the simple expedient of installing a couple of more valves and cross piping which will permit the pumping of the vapors from the tank car to the receiver after the liquid is all discharged from the car.

This system has been used not only for ammonia and chlorine but for many other volatile liquids. Reference to this principle was made in Method Three under Safe Handling Methods in the article, "Some Physical Considerations in the Safe Handling of Flammable liquids," by F. C. Mitchell and H. C. Vernon, published in the December 1937 issue of *Chemical and Metallurgical Engineering*.

FRED C. MITCHELL

Engineering Service Division  
Engineering Department  
E. I. du Pont de Nemours & Co.  
Wilmington 98, Del.

### Correction

Inadvertently, credit to the American Institute of Chemical Engineers was not given in connection with the article "Eliminate Stack Dusts and Mists," which appeared in our May issue. This article was taken from a paper presented before the Houston regional meeting, Feb. 26 to Mar. 1, 1950. —ED

# Generating Station "Makes Ends Meet" with Flexible Connectors

Moisture and mechanical protection, in addition to flexibility at terminal connections, were the primary considerations for some cables at the Public Service Electric and Gas Company, Sewaren Generating Station, Sewaren, N. J. To meet these requirements American Seamless Flexible Metal Tubing was chosen by the design engineers of this utility.

American "Seamless," in addition to being 100% water-tight, has several "plus" advantages. Alignment ease at rotating units, junction boxes and other equipment simplifies on-the-job installation. Savings in construction costs are an added premium obtained along with the flexible connection provided.

American Flexible Metal Hose and American Seamless Flexible Metal Tubing are made in types for a wide variety of services and conditions. For information, please address The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.



TRANSFORMER



MOTOR



EXCITER



wherever connectors must move... *American*

**FLEXIBLE METAL HOSE AND TUBING**



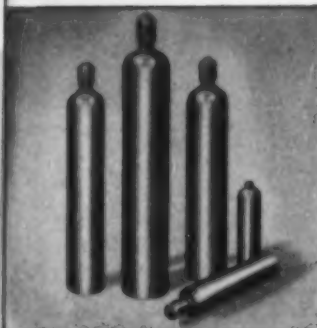
# Harrisburg

SEAMLESS STEEL

## Cylinders

# St

IN QUALITY  
IN SAFETY



**I**F YOU STORE OR TRANSPORT gases and liquids under high, medium, or low pressures . . . Harrisburg Cylinders are your logical choice.

They're made by a 97-year-old company which pioneered the manufacture of gas cylinders in America, and has developed specifications and construction techniques for gas containers since the industry's inception.

They feature uniformity of side walls and bottoms . . . and are built in virtually every size and capacity to I.C.C. 3A specifications. Domestic and Export types.



Contact us on your cylinder needs in any quantity

## Harrisburg

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HARRISBURG 16, PENNSYLVANIA



YEARS IN  
PENNSYLVANIA'S  
CAPITAL

### DEPARTMENT OF THE MONTH

## The Human Equation

(Continued from page 125)

sions and  $-1.00$  means complete statistical antagonism. That the chemist and the engineer have similar interests can be seen from their mutual correlation of  $0.88$  and the way they stack up against the interest scores of some other professions and occupations:

	Chemist	Engineer
Physicist . . . . .	$0.92$	$0.85$
Mathematician . . . . .	$0.80$	$0.66$
Physician . . . . .	$0.73$	$0.56$
Production manager . . . . .	$0.40$	$0.06$
Lawyer . . . . .	$-0.31$	$-0.44$
Sales manager . . . . .	$-0.74$	$-0.53$
Purchasing agent . . . . .	$-0.76$	$-0.05$
Personnel manager . . . . .	$-0.31$	$-0.31$
Advertising manager . . . . .	$-0.44$	$-0.55$
Banker . . . . .	$-0.67$	$-0.51$

There's a lot of thought food in these figures. By their interpretation it would seem that a chemical engineer would have most in common interestwise with the professions that handle things and data. By the same interpretation it would seem that his interests lie in opposite directions to those of people engaged in the management of people and money.

The obvious retort to these deductions is "What about the sales engineer or the technically trained executive who handles the people and money problems of a large organization wisely and well?" There are certainly enough examples to justify the posing of this question. Surely there are men whose interests must encompass those of the professions that handle people as well as those who handle things and data?

The answer probably lies in the fact that when such technically trained men enter a field where human relations is the principal job they are wise enough to hip-pocket their pure scientific approach. They do their utmost to learn and practice the earthy science-art of the bartender, taxicab driver and policeman in the appraisal and treatment of people. And they do their damdest to realize that the individual is not a three phase thermodynamic system but a three dimensional roulette wheel that may start or stop at any point.

The men who are successful in this undertaking don't look for handbooks on human relations. Hard-learned experience is their operating guide.

To the logically minded technical

man this might sound like abandoning order to jump into chaos. Once done, however, he will notice a new and bigger, though possibly less exact order commence to take form. He will begin to think in terms of the human strengths and weaknesses, the aptitudes and inaptitudes of his subordinates, colleagues and even his superiors. More than that he will find himself wondering about the "how and why they got that way." In response to these observations he will begin to steer his thoughts, govern his words and direct his actions to compensate for their deficiencies and channel his own strengths to the point where they are most needed. In short, he will experience the first oncomings of the "feel" of human relations.

Those who may believe that this concept of human relations has no place in the training or practice of an engineer are referred to the case study "What Industry Requires of the Graduate Engineer," by John Martin Bergen of the DuPont company in the March 1950 issue of the *Journal of Engineering Education*. The following excerpts are noted:

"The results of the study startled us when we made the check analysis. By the time we made the check analysis our faces were somewhat red because we found we were paying two dollars for the 'Psychological and Personality' factors for every dollar we paid for the 'Ability and Knowledge' factors on the more responsible jobs."

The report concludes: ". . . we rather sheepishly hang our heads in industry, because we have been asking for the engineering graduate to be the specialized peg for the special hole; the specialized peg being made unique by a wide variety of technical training. We have failed, rather miserably both with ourselves and others under us, to realize that the important thing that we need is taught over a period of years at home, at school, and in industry and represents a general conditioning or set in a person which is the result of a series of attitudes toward various groups, and individuals.

"At the present time, it is believed that no formal textbook is needed to teach these attitudes. Far more important are the attitudes of the high school and college instructor, the parent, the industrial foreman and executive as teachers and leaders."



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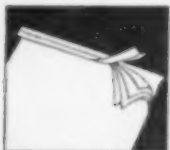
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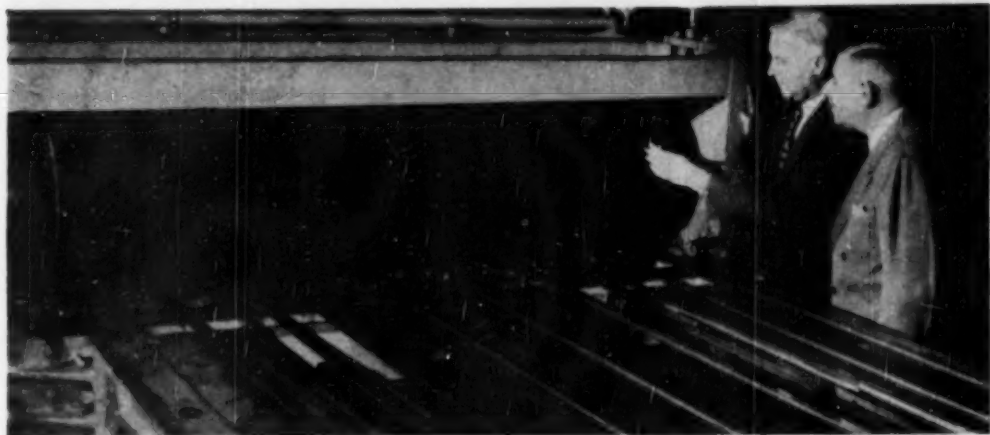
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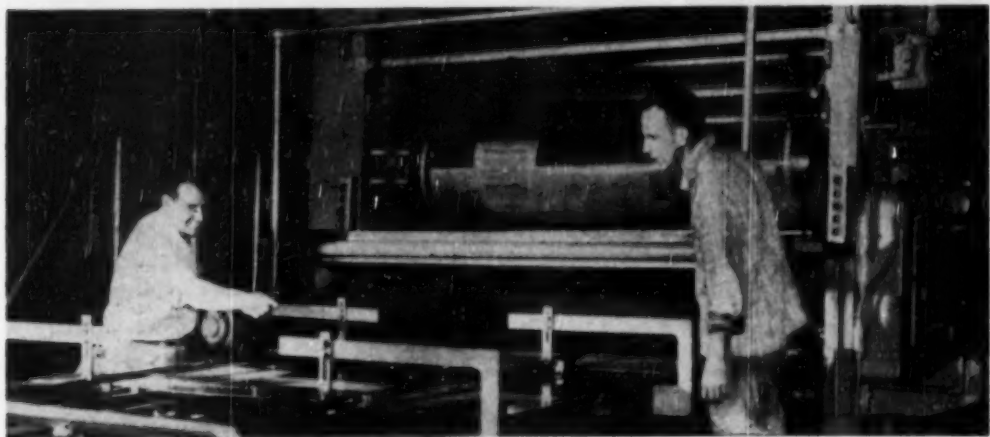
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# Handling, Packaging and Shipping

R. W. LAHEY, Editorial Consultant



Rollers for coating flat sheets before the drum-forming operations are examined by Rheem's Dr. Ott and Plant Manager Reber.



Lithographic press makes its first large-scale run in the new Rheem process for drum production. Here is a . . .

## New Process for Coating Large Steel Drums Before Fabrication

For many years printing, coatings and linings for small metal containers have been applied to the flat sheets before the packages were fabricated. In order to obtain the obvious advantages of this process, the Rheem Mfg. Co. at their New Orleans plant, have adopted

this method of coating and printing 55-gal drums. It was no easy task, as equipment for roller-coating, lithographing, conveying, and baking sheets of 3 ft. by 6 ft. in size, weighing 36 lb. was non-existent. In addition to the development of this equipment, it was

necessary to modify standard drum fabricating equipment so that the pre-coating would be preserved during the drum fabricating process.

After sheets are coated, a 1-in. strip on each side of both ends is prepared for welding by vacuum shot blast treatment. Welding consists of a continuous electric resistance lap-welding process which heats only the narrow seam strip. This avoids blistering or

(Continued on page 221)

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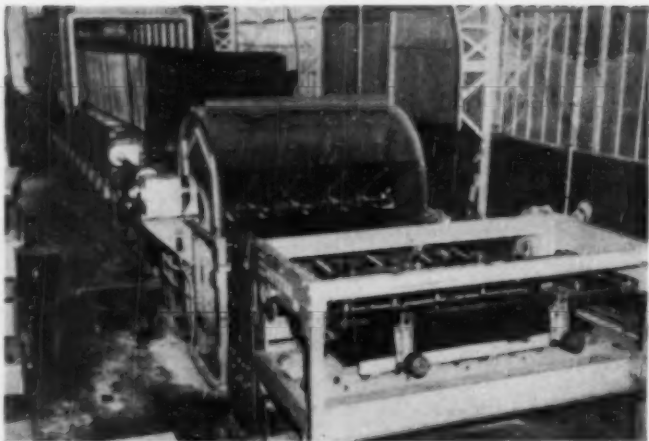
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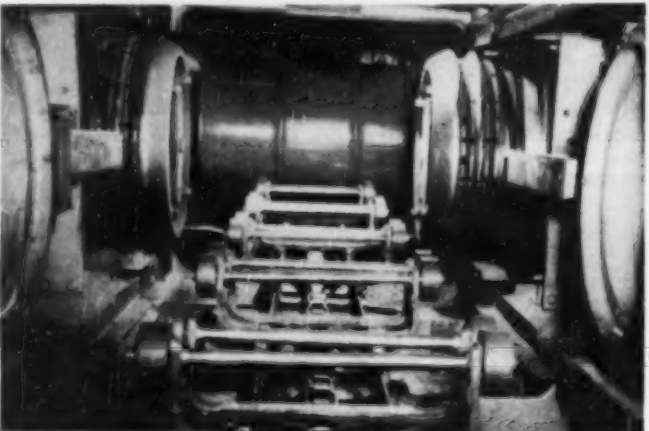
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1 Coated sheets are dried in this 170-ft. oven. Huge blowers cool them to handling temperatures, prior to next drum-forming step.

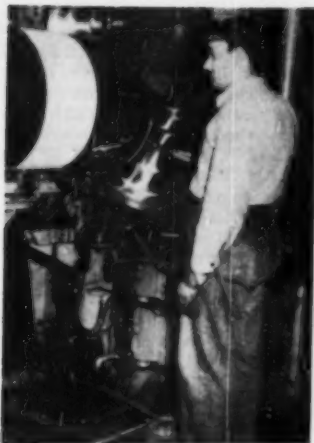


3 Flanges and rolling hoops are added. The drum has just left the swedger. Thickness of steel is not changed in these steps.



5 Finished drums are given exposure tests outside of the New Orleans plant. Effects of sun and humidity are recorded.





2 Electric Seam welder makes smooth lap-weld. Rolls hold drum in shape.



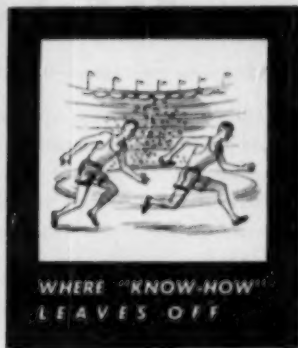
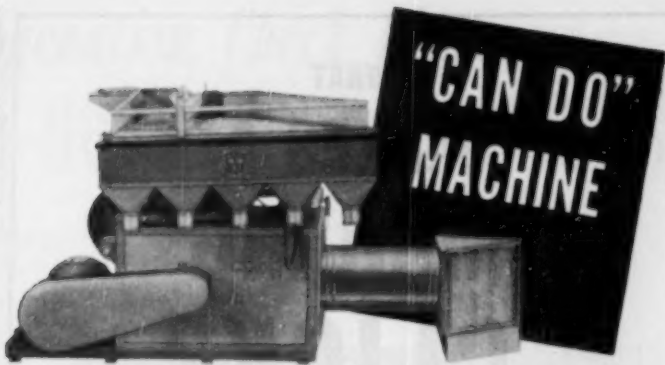
4 Welded side seams are sprayed. Chimes are sprayed as drum is spun.

#### PACKAGING, cont. . .

burning of the coating and lining adjacent to the welded area. Expanding rings for swedgers, which form the rolling hoops, were chrome plated, conveying equipment was covered with rubber and several alterations were made in the conventional double seamer. These changes are all designed to prevent damage to the coatings and printing during the drum forming operations.

The lithographing press is capable of printing trade marks and brand names with the same detail and authenticity as is demanded for small containers. The process of roller-coating of linings allows precision

(Continued)



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## PACKAGING, CONT. . .

work at controlled thicknesses. Special coatings, linings, and inks having proper characteristics for this method of application had to be found. Cleo resins, vinyls, epons, urea alkyls can be used in coatings applied by this process. The more brittle materials have been modified in an effort to provide the flexibility which is required. Linings can be applied from  $\frac{1}{4}$  mil to 2 mil thicknesses.

The drying-oven is in three sections, (1) a preheat portion is maintained at temperatures of 200–275 deg. F., (2) the baking portion is controlled at from 275–450 deg. F., (3) and a cooling section reduces sheet temperature at a controlled rate. It takes 28 min. to bake coated sheets.

The welded strip on the inside of lined drums is coated by a special touch-up technique developed for this purpose. The exterior welded area is coated by spraying an air-dry mixture of the roller-coating compound through a special mask. Finally the periphery of both double seams is sprayed with the same air-dry mixture.

It is reported that this new coating process has been so successful that Rheem is equipping their other plants to roller-coat drums.

## Calcium Chloride Packed In Plastic-Lined Bag

The adoption of a new type, polyethylene lined multiwall paper shipping sack for 100 and 25-lb. of flake calcium chloride packaging has recently been announced by Solvay.

This new package was adopted after extensive field tests and is reported to be stronger, possess a higher resistance to transmission of water vapor and have a longer storage life than the conventional asphalt lined bag.

## More ICC Regulation Changes For Your Files

The ICC has announced amendments to their Regulations for the Transportation of Explosives and Other Dangerous Articles. Adoption of these changes was compulsory after May 15. Changes of interest to the chemical industry follow, but the order should be studied for complete details.

SEC. 22. QUALIFICATION, MAINTENANCE AND USE OF PORTABLE TANKS. This new section, dealing with the qualifications and maintenance of portable tanks, defines these vessels as containers having water capacities between 750 and 1,000 lb. Retest requirements are covered in detail including tests for tanks that have been out of service for a year or more. Specifications for valves, piping, fittings and other appurtenances are prescribed.

SEC. 23. QUALIFICATION, MAINTENANCE  
(Continued)

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CHEMICAL ENGINEERING—June 1950

223

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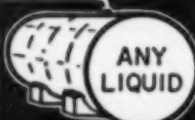
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## PACKAGING, CONT.

**NANCE AND USE OF CARGO TANKS.** Cargo tanks, as distinguished from portable tanks, are used for transportation aboard vessels and are not permitted to exceed a loaded capacity of 4,000 lb. This section covers in detail qualifications and maintenance as well as test requirements for these tanks. Specifications for valves, piping, fittings, pumps, compressors, etc. are prescribed.

**SEC. 109(e)(2) ETHYLENE OXIDE** may be shipped in addition to previously authorized containers in new type Spec. 1P lagged steel drums of not over 81 gal. capacity each. Drums must be equipped with safety devices of the fusible plug type with yield temperature not to exceed 165 deg. F. approved by the Bureau of Explosives; each drum must be tested for leakage at a pressure of at least 15 psig. with an inert gas before each refilling; top head of each drum must be plainly marked with paint "Keep This End Up." Filling shall be such that the container will not be liquid full below 65 deg. F. and the maximum filling for 61-gal. drums must not exceed 55 gal. of ethylene oxide at 60 deg. F.

**SEC. 122A CHLORATE AND BORATE MIXTURES** when containing no other ingredients and containing more than 25 percent chlorates are oxidizing materials and must be packed as follows:

- (1) When containing more than 35 percent but less than 50 percent chlorate as prescribed for inflammable solids n.o.s. in Sec. 172.
- (2) When containing more than 50 percent chlorate as prescribed for chlorates in Sec. 163.

(3) Those mixtures containing less than 50 percent chlorate and when packed in strong tight metal or fiber drums or in wooden boxes with tight inside metal containers are exempt from all regulations for freight and highway transportation.

**SEC. 294 SODIUM AMIDE** has been added to the list of inflammable solids and oxidizing materials and must be packed in specification containers as prescribed for metallic sodium and potassium.

**SEC. 299(e) ALKALINE CORROSIVE AND ALKALINE CAUSTIC LIQUIDS** n.o.s. AND ALKALINE BATTERY FLUIDS may be shipped in Spec. 103W, 103AW, 104, 104W, 104A or 104A-W tank cars in addition to those previously authorized.

**SEC. 264(h)(1) HYDROFLUORIC ACID.** The regulation requiring passivation of Spec. 1A metal drums has been changed to the following: "Each metal container, before being put into service, must be passivated by an efficient method."

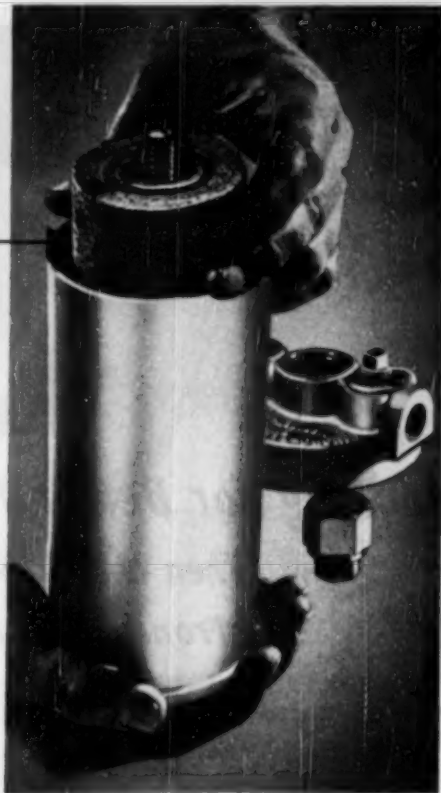
**SEC. 245(a)(2) 345 (a)(2) DIBROMOFLUORIDE ACID.** Inside containers other than India rubber or cellophane may be used if they are as resistant to action of this acid.

**SEC. 273(a)(c) 345 (a)(c) TRIOXIDE STABILIZED** may be shipped in Spec. 5C stainless steel drums in addition to containers previously authorized.

**SEC. 27B DIFLUOROPHOSPHORIC ACID, ANHYDROUS, MONOFLUOROPHOSPHORIC ACID, ANHYDROUS, HEXAFLUOROPHOSPHORIC ACID, AND MIXTURES THEREOF.** Regulations governing the packing of these compounds and mixtures have been amended as follows: Spec. 18A, 12B, or 21A.—Wooden boxes, fiberboard boxes, or fiber drums with inside containers which must consist of polystyrene or polyethylene bottles not over 2-lb. capacity each, closed by means of threaded acid-resistant caps with a gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to provide an acid-proof closure; caps must have at least one complete continuous thread and be wired or sealed to the bottle to prevent turning of cap after bottle is closed for shipment. Spec. 12B, 12C, or 12D.—Aluminum drums not over 55 gal. capacity.

Monofluorophosphoric acid, anhydrous, may also be packed in specification containers, 15A.—Wooden boxes with inside containers which must consist of glass bottles containing not more than 4 ounces of material, closed by means of threaded-type acid-resistant caps with a gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to give an acid-proof closure; caps must have at least one complete continuous thread and be wired to the bottle to prevent turning of cap when bottle is closed for shipment; or in glass bottles containing over 4 oz. but not over 2 lb. of material, with glass stoppers ground to fit and secured in place by means of hard drying wax placed over and around the stopper.

More ICC changes next month.—End



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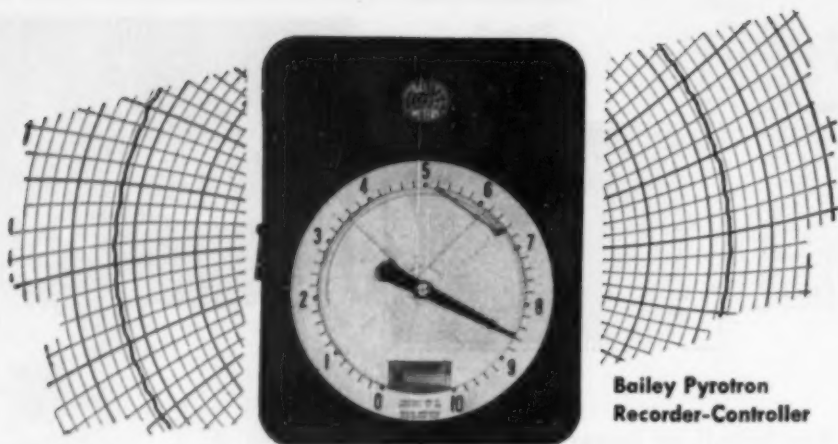
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P.21

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When used as materials in laboratory tests and analytical procedures, Davison silica gel can be supplied in bulk quantities. The material is also available in various degrees of purity for laboratory research purposes.

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## smoother riding

—on G-W bulk handling equipment means

## less "break-up" for carbon black pellets



Showing enclosed, motor operated belt feeders, continuous bucket elevators and storage tank on roof of plant.



Slow speed continuous bucket elevator carries pellets from conveyor beneath track level to roof storage.



Unloading from one of the hopper ports through the automatic car sealing valve.

Materials handling systems for bulk chemicals is a G-W specialty. A typical example is the system illustrated here for conveying and elevating pelletized carbon black from hopper car to process. Advantages of this type of installation are many, some of which are:

- 1—Carbon black dust is virtually eliminated since the system is completely enclosed from automatic car sealing valves through storage bin to process.
- 2—Valuable floor space is released since bulk storage can be located on roof or any other outside point.
- 3—Handling is automatic which eliminates up to four separate handling operations, necessary when carbon black is used in non-pelletized form.
- 4—One man can unload a full car in less than six hours, his only manual effort being to fasten unloading chutes to car ports.

If you have a problem handling chemicals in bulk, be it carbon black, soda ash, sodium sulphate, chrome ore, bauxite, etc., consult a G-W Materials Handling Engineer. He is backed by 136 years of engineering design and knowledge in the materials handling field. His recommendations, drawn from this extensive experience can point the way to more economical movement and storage of materials in your plant.

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WHEN YOU THINK OF MATERIALS HANDLING — THINK OF GIFFORD-WOOD

# News From Abroad

SPECIAL CORRESPONDENCE

## British to Make Their Own Polystyrene This Summer

London—First production of polystyrene in the U. K. will begin this summer at Monsanto Chemicals Ltd.'s new plant at Newport, South Wales.

Initially, the polymer will be made from imported monomeric styrene, but in the not-far-distant future the monomer itself will be produced in Great Britain. Monsanto and British Petroleum Chemicals Ltd. (the latter a jointly-owned subsidiary of Anglo-Iranian Oil Company and The Distillers Company) have just announced the formation of a new cooperative venture, to be called Forth Chemicals Ltd. to manufacture the monomeric styrene required for Monsanto's polystyrene production and other plastics manufacturers.

The plant for Forth Chemicals is being designed by engineers of B.P.C., who are also constructing, with the help of Stone & Webster Engineering Corp., New York, the B.P.C. petrochemicals plant at Grangemouth, on the Firth of Forth. The Forth Chemicals plant will probably adjoin the B.P.C. plant.

Capacity of both plants is still not revealed. Nor will Monsanto talk about its capacity for turning out polystyrene. The B.P.C. plant is still in the early stages of construction, and it will be at least twelve months more before it goes on stream.

## More Refinery Capacities For Canada

Ottawa—McColl-Frontenac Oil Co. has awarded a contract to Foster Wheeler Ltd., St. Catharines, Ont., to design and build a crude processing and catalytic cracking unit, for the new \$10 million refinery under construction at Edmonton, Alberta.

Subcontracts will be let to several Canadian firms by Foster Wheeler which will, however, do much of the work itself. The project is scheduled for 1951 completion and the huge new refinery will process crude from Leduc and Redwater fields.

Contract for construction of the two million barrel per year British

American refinery on the outskirts of Edmonton, Alberta, has been awarded to Canadian Kellogg Co., Ltd., Toronto. Estimated cost of the plant has not been made known but it is understood to be more than \$8 million. Plant construction is expected to take one year.

## Canada Plans to Build New Atomic Energy Plant

Ottawa—A new atomic energy plant at Deep River is planned for 1951 in Canada. Dr. C. J. Mackenzie, head of the National Research Council of Canada, has tentatively confirmed. It will take several years to complete the new project, according to present expectations.

Meanwhile, construction on laboratories and other projects valued at \$500,000 is to start this spring at Deep River but these are said to be "non-atomic" undertakings.

## Construction Starts on Refinery at Antwerp

Antwerp—Construction is under way on a complete 30,000 barrel-per-day refinery for the Societe Industrielle Belge des Petroles at Antwerp, Belgium. The contract for the work is held jointly by M. W. Kellogg Co. and its European subsidiary, Kellogg International Corp.

An indication of the recovery of European industry since the end of the war is seen in the fact that Kellogg International Corp. is directing the purchase of a major portion of all materials and equipment for this multimillion-dollar project from Belgian and other non-dollar manufacturing areas.

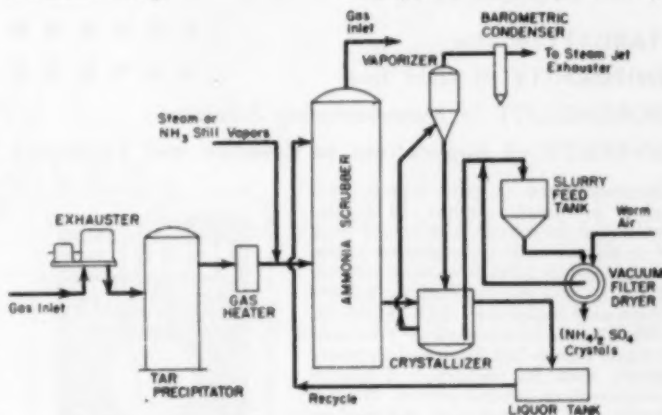
As part of the over-all industrial expansion in Europe, the new plant, being financed by Belgian interests, will utilize normal refining processes and will have facilities for operation as a completely integrated refinery.

The refinery is on a site adjacent to the Scheldt River, and extensive development work is being undertaken by the Port of Antwerp Authority to improve facilities for the ships that will bring the crude oil to the refinery.

In planning the refinery, sufficient space has been provided for the future addition of process units to produce additional products, such as lubricating oils and high octane gasoline. Completion is scheduled for mid-1951.

## Australian Crystal Ammonium Sulphate Plant

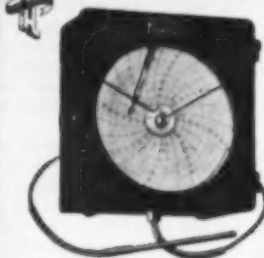
Melbourne—Australian Iron & Steel Ltd. has completed a semi-continuous plant at Port Kembla, New South Wales, for production of ammonium sulphate by the Wilputte crystal sulphate process. (Continued)



Wilputte crystal ammonium sulphate process is used in Australia's unit.

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### FOREIGN NEWS, cont. . .

A saturator-type ammonium sulphate plant was built in 1937 to treat the gas from a battery of 72 coke ovens. A comprehensive steel plant development project, involving the erection of 48 additional coke ovens, has made more ammonia gas available for recovery.

Because of the difficulty of producing consistently high-quality and dust-free crystals by the saturator process, it was decided to adopt the process developed in 1941 by the Wilputte Coke Ovens Corp.

The new plant produces crystals of large and uniform size, including 45.5 percent of 16-mesh and 46.0 percent of 30-mesh size. Only 1.7 percent of the crystals from the saturator plant reach these screenings, the balance passing through or remaining on a 60-mesh screen. Because of the free-running quality of the crystals, only 12 bags are required per ton of product compared with 14 bags for ammonium sulphate from the saturator plant.

### New ICI Plants Make Plastics Down Under

Melbourne—Imperial Chemical Industries of Australia and New Zealand Limited has completed a new urea-formaldehyde plant at Deer Park, Victoria, the site of ICI's Australian Nobel subsidiary.

The Botany plant, near Sydney, has started commercial production of polyvinyl chloride plastics. The monomer has been made for some time there. Several polyvinyl chloride plastics with electrical engineering and general applications will be available from this plant.

### New Zealand Fertilizer Production Sets Record

Wellington—New Zealand production of superphosphate established a new record in 1949 with 614,100 tons, according to the dominion's Department of Agriculture. Production for the preceding years was around 550,000 tons. The chemical fertilizer industry employs about 1,100 workers. Most of them are engaged in the production of superphosphate.

### India Extends Duties On Aluminum

New Delhi—India's aluminum industry has been granted an additional three-year term for its 30 percent protective duty by special act of the Indian Parliament. In 1949 the two

(Continued)



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## MICRON SIZE

°C	Microns
43.6	0 - 1/3
12.2	1 - 1
12.6	1 - 2
14.3	2 - 3
6.9	3 - 10
10.5	10 - plus

## CHEMICAL ANALYSIS

SiO <sub>2</sub>	44.60
Al <sub>2</sub> O <sub>3</sub>	39.67
TiO <sub>2</sub>	1.65
Fe <sub>2</sub> O <sub>3</sub>	0.37
CaO	0.00
MgO	0.00
Na <sub>2</sub> O, K <sub>2</sub> O	0.00

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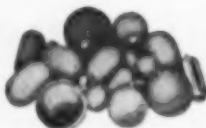
ALABAMA'S FINEST

## Nicholson Steam Traps

# STOP BACK-UP of CONDENSATE

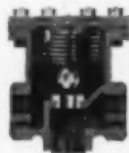
Operate on Lowest Temperature Differential

Repeated comparative tests by large trap users show that Nicholson steam traps operate on lowest temperature differential, and thus prevent waterlogging. Plant records show that, by keeping equipment full of live steam, they have increased production of cooking kettles, for example, as much as 30%. Widely specified for preventing damage to thin gauges. Eliminate "cold blow" in unit heaters. 5 types for every industrial application. Size 1/4" to 2"; press. to 225 lbs. BULLETIN 450.



operating mechanisms and on tanks or vessels. 2-day delivery. BULLETIN 348.

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TYPE B



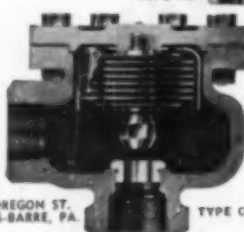
TYPE A



TYPE AHV



TYPE AU



TYPE C

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## FOREIGN NEWS, cont.

companies producing aluminum turned out less than 3,000 metric tons of the metal compared with 4,000 metric tons installed capacity. The government has assigned them a combined production target of 3,500 metric tons.

## Canadian Colleges Graduating 448 Ch E's This Year

Ottawa—A breakdown of engineer graduates in 1950 from Canadian universities discloses that 448 will graduate this year as chemical engineers in Canada, out of a total engineering class of 3,661.

These chemical engineers will graduate from the following colleges: Saskatchewan University, 22; Alberta University, 60; Nova Scotia Tech., 15; Laval University, 10; McGill University, 64; Ecole Poly., 5; University of Toronto, 158; Queens University, 48 and University of British Columbia, 66.

## Canadian Polyethylene Unit Goes on Stream

Ottawa—First shipments for Canadian Industries Ltd.'s new polyethylene plant at Shawinigan Falls, Que., have commenced. The initial production is polyethylene tubing only. Machinery for extrusion of film has been installed and equipment for sheeting manufacture may be ready for operations before May 1.

Until this year, all polyethylene film used in Canada had been imported from the United States.

## Prince Rupert Sulphite Mill To Be Operating in 1951

Ottawa—Construction of the \$35 million sulphite mill of Columbia Cellulose Co., nine miles from Prince Rupert, British Columbia, is expected to be completed in 1951. The mill capacity is reported to be 250 tons a day. It will use about 75,000,000 to 100,000,000 logs annually.

## India Pushes Starch Duties Higher

New Delhi—Enhanced protection of the Indian starch industry has been approved by the Indian government on recommendation of the Tariff Board, and the period of protection extended for another two years.

The duty on starch has been increased from 18 to 20 percent, on farina from 18 to 20 percent. On sago flour, which was free, a 20 percent duty has been set.



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Dry Chemical Extinguisher  
a 44% margin of safety!**

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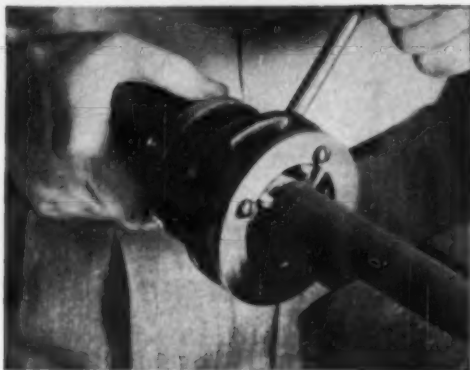
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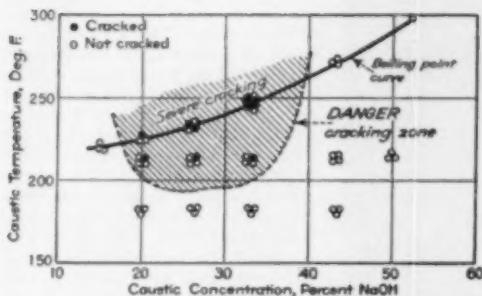
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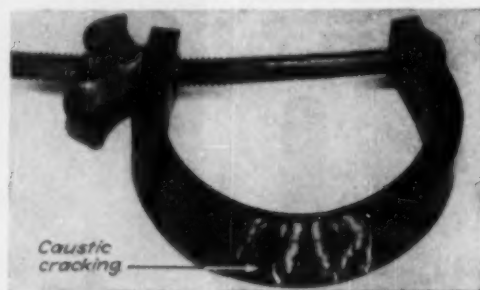
These products sold in Canada by  
National Carbon Limited, Toronto 4

# The Corrosion Forum

EDMOND C. FETTER, Managing Editor



Caustic users will do well to keep out of the zone above 180 deg. F. and between the concentrations, 15 and 43 percent.



Cracks in stressed steel bar developed after five days in hot concentrated NaOH. Same thing happens in plant equipment.

## Caustic Danger Zone

Test locates temperatures and concentrations where caustic soda is liable to crack stressed steel

A. A. BERE, Supervising Chemist, Boiler Research Section, Bureau of Mines, College Park, Md.

W. F. WALDECK, Associate Director of Research, Wyandotte Chemicals Corp., Wyandotte, Mich.

The results here reported were obtained by C. K. Stoddard some 10 years ago during a cooperative study\* of the cracking of stressed steel in hot caustic solutions. Publication at this time is made in response to renewed interest in possible cracking of tanks, evaporators, and heat exchangers in which stressed steel is exposed to solutions containing concentrated sodium hydroxide.

The tests are summarized in the graph above. Cracking resulted in 11 out of 52 test specimens run 30 days or longer. No cracking was produced in 15 or 43 percent caustic soda at any of the temperatures tested; also, no cracking resulted at 180 deg. F. at any concentrations tested. In the zone within these limits (roughly, the shaded area in the graph) the probability of crack development was about 40 percent. Such cracks as were examined were intercrystalline.

\* Sponsored by the Wyandotte Chemical Corp. during a study of boiler-steam cracking by the Joint Research Committee on Boiler Feedwater Studies and the Bureau of Mines.

It was also found that the region in which cracks occur is greatly extended, and the probability of cracking within the region is greatly increased, through the addition to the solution of small concentrations of lead oxide or of oxidizing materials such as nitrates and permanganates. Runs of 38 days with rubber-coated test specimens showed that under the conditions studied, the coatings safeguarded the metal from attack by the hot caustic solutions.

Among caustic producers it has for many years been a great rarity to hear of a case of steel's cracking by caustic embrittlement. The entire industry has long been converted to nickel equipment, principally because of the requirements for low iron content in the product. Caustic embrittlement in a producing plant is therefore practically unheard of. Among consumers however this is not the case. Many of them heat or boil caustic soda solutions and frequently suffer failure of the vessels involved. For instance, just a few months ago a chemical plant replaced an 8,000 gal. steel distillation vessel that had been ruined by caustic cracking. During the course of the distillation the caustic soda content of the particular process liquor passed into the cracking zone shown in the graph.

In handling hot, concentrated solutions of caustic soda in steel, cracks have developed in highly stressed parts, such as rivet heads, riveted seams, and welds. Avoidance of the severe-cracking zone outlined by this study should greatly reduce the probability of such cracking, but it cannot be said that conditions outside this zone will not produce cracking in highly stressed steel over long periods of time.

### THE TEST METHOD

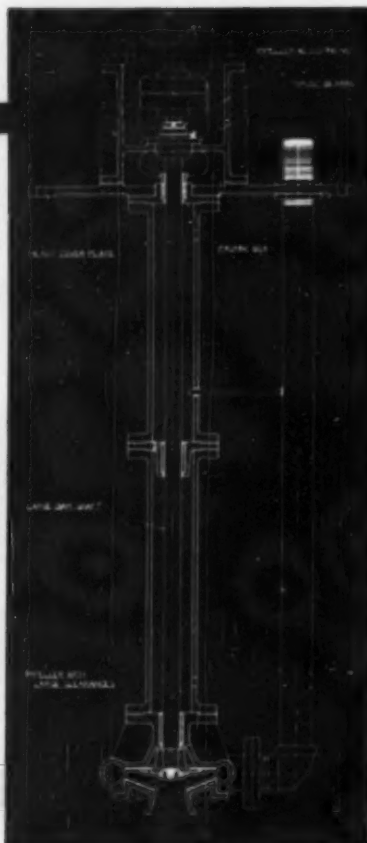
The scope of the study included tests in caustic concentrations of 15 percent to 50 percent carried out either at the atmospheric boiling point of the solutions or at somewhat lower temperatures.

All of the tests were carried out by immersing one or more U-bend specimens like the one in the photograph in a concentrated sodium hydroxide solution. The specimen was made from a bar of cold-rolled steel (SAE 1020)  $\frac{1}{4}$  in. thick,  $\frac{3}{4}$  in. wide, and 6 in. long. The "U" was made in a jig, whereby the bar was bent 180 deg. around a form 24 in. in diameter. The ends of the bar were drilled for a  $\frac{1}{4}$ -in. bolt, and immediately before immersion into the test solution the bolted ends were drawn together about 1 in. to produce an elastic stress in the outer surface of the steel.

Tests at the atmospheric boiling point were run in gas-heated steel pots, each equipped with a steel cover which supported a steel reflux condenser. A steel-plugged hole in the cover provided for adding make-up (Continued)



(Right) Structural details of Lawrence Vertical Chemical Pump.  
(Below) Vertical Chemical Pump mounted inside of tank.



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### CORROSION FORUM, cont.

during the tests. The containers were made from sections of 4½-in. steel tubing welded to steel base plates, and each had a capacity of 1,400 ml. The volume of solution for each test was about 800 ml., and this volume was restored by adding distilled water to such pots as had lost vapor through the cover joints and around the make-up plugs. The temperature at which each test was run was the boiling point of the test solution. As concentrations varied considerably, in some case 100 percent or more, the test temperature also varied (the graph shows the relationship between concentrations and boiling points).

Much better control of concentration and temperature was achieved for the tests below the atmospheric boiling point; these were carried out in the same pots, now equipped with tight-fitting steel covers, and loss of vapor was negligible. A well-insulated air thermostat, equipped with circulating fan and heat control, maintained the nonboiling solutions at the desired temperature.

The major study concerned three batches of material furnished by the Wyandotte Chemical Corp. and identified as lime-soda liquor, mercury-cell

(Continued)

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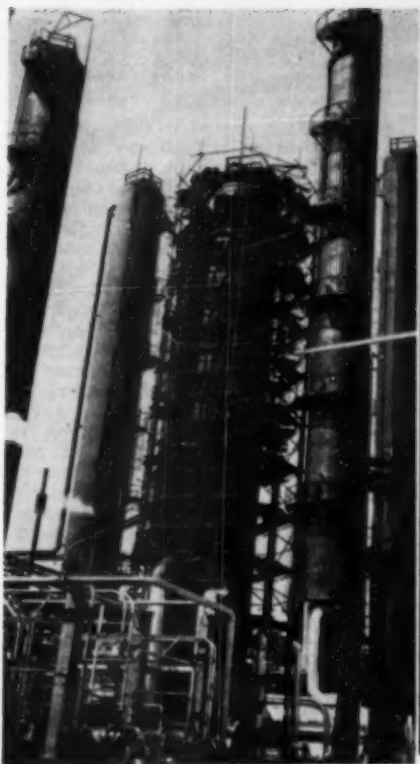
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## CORROSION FORUM, cont. . .

liquor, and diaphragm liquor; their chemical analyses were:

	Lime Soda Liquor	Mercury Cell Liquor	Diaphragm Liquor
NaOH, %	52.35	49.77	53.49
Na <sub>2</sub> CO <sub>3</sub> , %	0.11	0.95	0.13
NaCl, %	0.23	0.008	1.26
Na <sub>2</sub> SO <sub>4</sub> , %	0.06	0.0066	0.01
NaClO <sub>2</sub> , %			0.124
Fe, ppm	12.5	4.2	63.0

Tests were run on the liquors as received and on dilutions to as little as 15 percent sodium hydroxide. The three types of caustic soda were essentially equivalent with respect to crack development, and the results have been confirmed with caustic soda from different manufacturers.

The test period varied. Most of the earlier runs were for 6 to 14 days, during which frequent inspections were made for cracks in the test specimens. Inspection consisted of washing the steel in hot water and watching the drying of the film on the test surface; a telltale interruption in drying occurred at cracks. When it was later found that test specimens in some solutions developed cracks more slowly, often requiring an exposure of about 30 days, the test periods were lengthened; the longest run was 62 days. During the longer tests, inspections for cracks generally were made at 10-day intervals. —End

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Accuracy of temperature readings depends primarily on the accuracy of thermocouples at the source of heat. Whether you require standard or specially designed thermocouples, you will always find Thermo Electric's Couples constructed to transmit temperature changes with a maximum of accuracy and responsiveness.



Our Type 202D Bayonet Immersion Contact Thermocouple with Quick Coupling Connector.

We have designed many types of thermocouples especially for Chemical Processes. Send for our Catalog E describing these Thermocouples, Pyrometers, Lead Wires and Accessories.

**Thermo ELECTRIC CO.**  
FAIR LAWN, N. J.

# STEAM JETS

For Heating  
and Circulating

## ACID SOLUTIONS

DURCO circulating Steam Jets are patented devices for:

1. *Heating and circulating* acid solutions used in pickling, washing, etc.
2. *Dissolving* powder and lump chemicals, such as copper sulfate, sodium chlorates, and other salts, alum, dyes, coagulants, etc.
3. *Digesting* ores, such as bauxite, phosphates, barytes, ilmenite, etc. in acid solutions.
4. *Cooking* various materials, such as malt, *hastening* acid separation, and other work accomplished by the introduction of steam.

**CORRECTLY DESIGNED**—Eliminate steam or "water hammer"; provide uniform temperatures throughout the solution. Operation is smooth and practically noiseless. Reduction of vibration lengthens tank life.

**MADE OF ACID-RESISTANT ALLOYS**—These jets are available in the well-known Durco alloys:

**DURIRON**, a high-silicon iron, possesses excellent resistance to the attack of sulfuric, nitric, acetic, dilute hydrochloric and most other acids, as well as alum and other corrosive solutions.

**DURIMET 20**, an austenitic stainless steel alloy with high strength and machinability, resists sulfuric acid, oleum and sulfurous acids. Used for sulfuric-hydrofluoric and nitric-hydrofluoric pickling acids.

Can also be supplied in other alloys to meet special conditions.

Write for new Bulletin 1804, which describes these Steam Jets in detail.

**THE DURIRON CO., INC.**

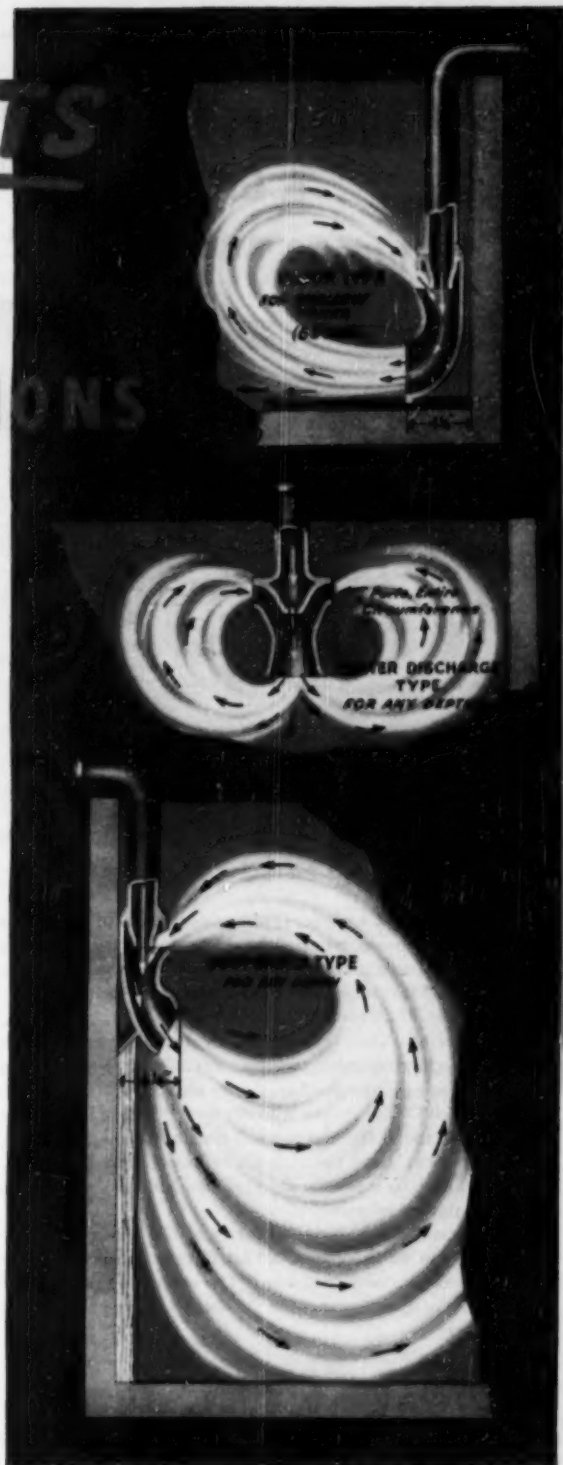
DAYTON 1, OHIO

Branch Offices in Principal Cities



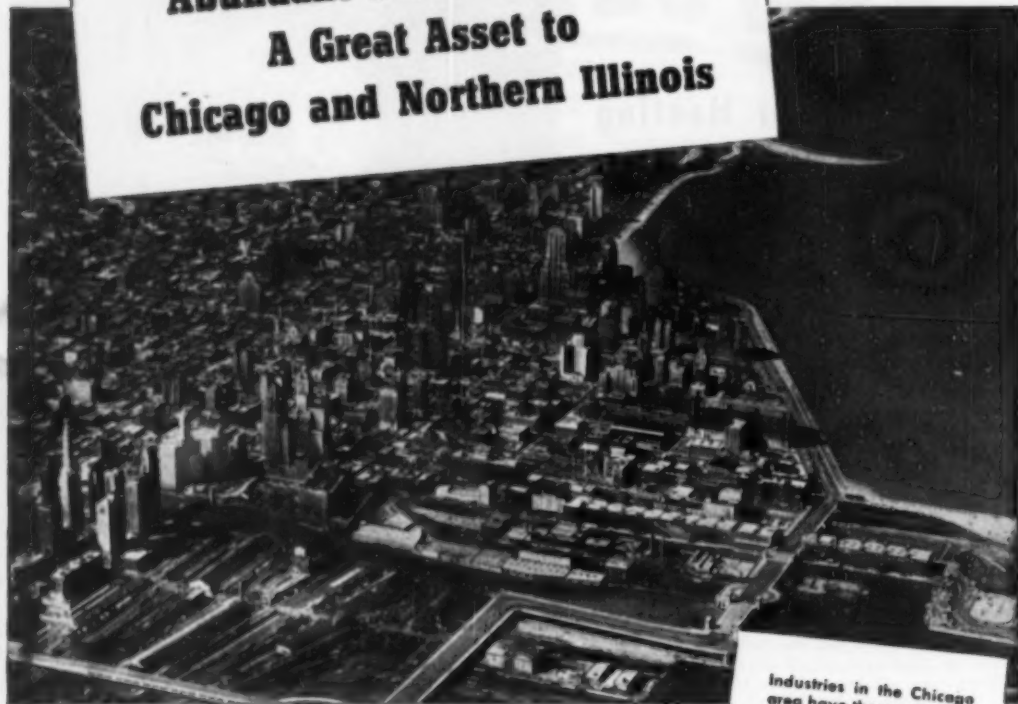
38-GM

CHEMICAL ENGINEERING—June 1950



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## Abundant Fresh Water . . . A Great Asset to Chicago and Northern Illinois



An unfailing supply of fresh water, so essential to numerous industrial operations, is one of the chief assets of the Chicago area. And in addition to abundant water, industry in the Chicago area has the added advantage of the lowest cost water in the country.

Lake Michigan, at Chicago's front door, provides an unlimited source of water, immediately available for all uses. Continuously expanding pumping facilities, capable of furnishing approximately 2 billion gallons per day, assure uninterrupted water service to the 3,725,000 Chicagoans who are now utilizing Lake Michigan water. These users, and the users in nearby cities and villages of the Chicago area, have the security of knowing that Lake Michigan will continue to meet the growing demands of expanded industry and greater population.

In order to assure the purity of the water supplied through the Chicago water system, a vast filtration project is under way. The first unit is now completed. The complete project, as planned, will provide filtered water for the entire Chicago metropolitan area.

### Industries in the Chicago area have these other outstanding advantages:

- Railroad Center of the United States • World Airport • Inland Waterways • Geographical Center of U. S. Population • Great Financial Center • The "Great Central Market" • Food Producing and Processing Center • Leader in Iron and Steel Manufacturing • Good Labor Relations Record • More than 2,500,000 Kilowatts of Power • Tremendous Coal Reserves • Good Government • Good Living • Good Services for Tax Dollars.

You are invited to write for information concerning Chicago's advantages for your business. We will gladly furnish you a confidential survey of conditions here, as they apply to your specific problem. There is no obligation, of course.

### TERRITORIAL INFORMATION DEPARTMENT

Marquette Building—140 South Dearborn Street, Chicago 3, Illinois

COMMONWEALTH EDISON COMPANY • PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS  
WESTERN UNITED GAS AND ELECTRIC COMPANY • ILLINOIS NORTHERN UTILITIES COMPANY



# Names in the News



## MAN OF THE MONTH

### John D. Fennebresque

John D. Fennebresque, Class of 1939, general manager of the chemical division of Celanese Corp. of America, received the 1950 Award of the Yale Engineering Association. He was cited for his work with Celanese in connection with the oxidation of natural gas hydrocarbons in the production of a long series of aliphatic compounds and his wartime work with the Office of the Rubber Director in initiating and carrying into production a system of agitation as applied to copolymerizations, leading to simplification and improvement of processes for the manufacture of synthetic rubber.

The award is given every year to a university alumnus in engineering not more than 15 years out of college in recognition of work done and to encourage further achievement. It is designed to recognize brilliant young men in the mid-stream of their careers.

Physically commanding, with an aggressive capacity for work, a lightning mind, and an ability to concentrate, John Fennebresque makes it possible to understand how he has accomplished so much in so little time. More remarkable is the grace with which he carries off his difficult "boy wonder" role. A boiled-down consensus of his associates indicates that he manages this by a complete, not just fashionable, lack of swagger.

He was born in Boston, April 11, 1917; reared in France, Philadelphia, Northampton, Mass., and Montclair, N. J. At Yale he went in for varsity swimming, intercollegiate football, was president of Chi Phi Fraternity. After graduation with a B.E. degree in chemical engineering, he joined Monsanto Chemical Co. His jobs there varied, including technical sales, production and process development at the St. Louis, New York and East St. Louis plants and offices. In 1943 he joined the Office of the Rubber Director as member of the research and development staff. During a year and a half with them, he was responsible for the coordination of certain process engineering programs at various rubber production plants, which resulted in change-over of some plants from batch to continuous polymerization methods, and in improved methods of agitation in the reactors.

In October 1944, Mr. Fennebresque came to Celanese and immediately became a dollar-a-year consultant to the director of rubber research. From February until June 1945 he was on overseas duty with the Technical Industrial Intelligence Committee of the Joint Chief's of Staff. In a few weeks prior to his overseas duty, he learned German well enough to work without an interpreter in interviewing German technical personnel and accumulating data concerning synthetic rubber and acetylene technology developed by German scientists up to the end of the war. It is said that at the age of 28, in an insignia-free uniform and with Berlitz German, Mr. Fennebresque cowed the I.G. Farben board of directors into divulging much valuable information.

Since August 1946, he has had over-all responsibility for the policy of Celanese's chemical division regarding administration, sales, production and research. The Chemical Engineering Achievement Award for 1949, sponsored by McGraw-Hill Publishing Co., was presented to Celanese largely because of the activities of the chemical division.

Mr. Fennebresque devotes his spare time to his wife and two sons, and home in Oyster Bay, N. Y. Very logically his favorite avocations are sailing, landscaping and gardening.

Dana W. Atchley, Jr., has been appointed director of engineering for Tracerlab, Inc., Boston. William A. Kerr has been made general sales manager.

Joseph H. Brennan, leader in the development of production methods for alloys used in stainless steel and chief metallurgist of the electro

metallurgical division of Union Carbide and Carbon Corp., Niagara Falls, N. Y., has been selected as the 1950 winner of the Jacob F. Schoellkopf Medal. Presented by the western New York section of the American Chemical Society, the award particularly honors Mr. Brennan for the economical production of ferrochromium of very low car-

bon content, and the development of processes for extracting tungsten and other less common metals from their ores.

Ralph W. Bost, Smith Professor of Chemistry and head of the department of chemistry at the University of North Carolina, has been awarded the 1950 Herty Medal. For outstanding contributions to chemistry in the South east, the medal is given annually by the chemistry club of the Georgia State College for Women to a scientist selected by the Georgia section of the American Chemical Society. Dr. Bost is a director of the ACS and chairman of the society's division of organic chemistry.



R. W. Bost



L. J. Richards

L. J. Richards, chief engineer of Dow Chemical Co.'s Midland, Mich., division since 1934, has been named director of engineering. He will be responsible for coordinating the activities of the company's divisional engineering departments which have previously operated independently. E. R. MacLaughlin succeeds him as chief engineer in Midland.

H. G. Ebdon and William P. E. Ainsworth have been elected vice presidents of Combustion Engineering-Superheater, Inc., New York. Mr. Ebdon will continue as general sales manager of boilers and related equipment; Mr. Ainsworth will continue in charge of purchasing and production for the company's six American manufacturing plants.

James E. Hughes has been elected vice president of Western Supply Co. of Tulsa. He joined the company in 1946 to develop its heat exchanger department.

Joseph E. Baker has been appointed

(Continued)



# THE RIGHT OIL BURNER OR GAS BURNER FOR YOUR JOB

## TYPE "SA"

(For use where steam is available) atomizes thoroughly and burns completely, the lowest and cheapest grades of fuel oil and tar, requiring only low oil pressure and temperatures.  
Send For Bulletin No. 21.

## TYPE "S-A-L"

(Large capacity burner similar to TYPE "S-A-R") is adaptable in combination with powdered coal burners in large boilers.  
Send For Bulletin No. 24.

## TYPE "S-A-R"

(Where steam, or gas is available for atomizing) safely and efficiently burns residues cleaned from process.  
Send For Bulletin No. 25.

## COMBINATION GAS AND OIL BURNER

—the "AIROCOOL" Gas Burner in combination with a TYPE "S-A-R" Oil Burner.  
Send for "Airocool" Brochure.

## "AIROCOOL" GAS BURNER

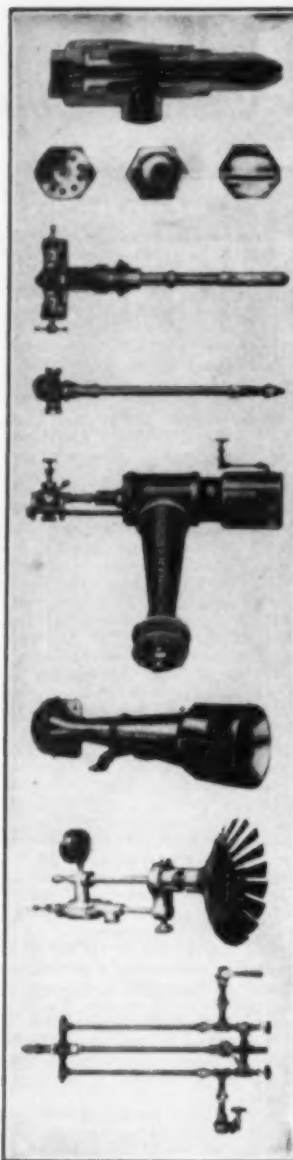
(Of venturi type), assures low turndown without backdraft.  
Send for "Airocool" Brochure.

## MECHANICAL PRESSURE ATOMIZING OIL BURNERS

with multi-vane type air diffuser to give a positive swirl to entering combustion air.  
Send For Bulletin No. 15.

## TYPE "S-A-D"

(Refuse Oil Burner) burns acids and caustic oils, sludges, asphalt, tank bottoms, polymer oils, heavy petroleum, organic oil residues, waste cutting oils, sulphate pulp liquors, etc.  
Send For Bulletin No. 21.



OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes: STEAM ATOMIZING OIL BURNERS; ROTARY-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS for small process furnaces and heating plants; FUEL OIL HEATERS; FUEL OIL PUMPS and HEATING UNITS; FURNACE RELIEF DOORS; AIR INTAKE DOORS; OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

Main Offices & Factory: 1235 EAST SEDGLEY AVENUE  
PHILADELPHIA 34, PA.

SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD  
HOUSTON 2, TEXAS



## NAMES IN THE NEWS. cont. . .

vice president, general manager of Niagara Falls operations of Matheson Chemical Corp., Baltimore.

S. D. Kirkpatrick, editorial director of Chemical Engineering and Food Industries, has been re-elected as a director-at-large of the Armed Forces Chemical Association.

Robert E. Wilson, chairman of the board, Standard Oil Co. (Indiana), has been given the American Petroleum Institute's top honor in refining—a Certificate of Appreciation from its division of refining.



R. E. Wilson

Scrutiny of his dossier reveals that his interests began to focus on refining in 1919 when he became director of M.I.T.'s research laboratory of applied chemistry. He worked on refining problems for the Vacuum Oil Co. and Standard Oil of N. J. and on motor fuel problems for General Motors.

He began pioneering the application of chemical engineering principles to the oil industry when he became assistant director of research for Standard Oil Co. of Indiana in 1922. He headed the newly formed development and patent department in 1929, became a director in 1931 and a vice president in 1933. His researches included flow of fluids, oiliness, corrosion, motor fuel volatility, plasticity, and humidity. He is the inventor or co-inventor of about 90 patents.

As vice chairman, then president of Pan American Petroleum & Transport Co., he expanded its activities into all branches of the oil industry. In 1940 he was selected to represent the oil industry on the Industrial Advisory Commission to the Council of National Defense. In 1944 he became chairman and chief executive officer of Standard Oil Co. of Indiana.

He was awarded the Chemical Industry Medal for 1939 and the Perkin Medal for 1943. On the latter occasion, Thomas Midgley, describing his first meeting with Dr. Wilson, referred to him as, "a rather swarthy individual—I may have been mistaken, but I gathered the impression that he was somewhat above average in intelligence."

Ford Ballantyne, Jr., has been elected a vice president of Wyandotte Chemicals Corp., Wyandotte, Mich. William Day, head of the patent section of the research and development division, has been appointed assistant to the president and director of legal activities.

Warren K. Lewis, professor emeritus  
(Continued)

# Announcing the NEW JENKINS **SWINGTITE**

with an exclusive new design  
that assures smooth action,  
positive closure, and longer life

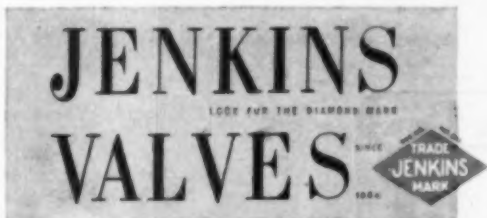
In the new Jenkins SWINGTITE Fast-Action Bronze Gate Valve, the exclusive rolling disc and guide track design lengthens valve life and assures maximum tightness as it prevents uneven wear of seating surfaces. As the valve is opened or closed, guide rims around the seating surfaces of discs roll freely over guide tracks cast in the body, distributing wear evenly, dislodging foreign matter, and providing a polishing action for seating surfaces.

The SWINGTITE can be opened or closed instantaneously and easily with less than a quarter turn of the malleable iron lever which activates the self-adjusting ball and socket type double disc.

Wherever full, free flow is essential . . . where valve opening or closing must be instantaneous . . . you will see more and more Jenkins SWINGTITE Bronze Gate Valves setting new standards of performance and endurance. They are recommended especially for such services as laundry machinery, dish-washing equipment, gasoline and fuel oil lines, fire extinguishing steam lines in kitchens, and dispensing lines to tanks or vats.

Get all the facts on the new Jenkins SWINGTITE. Find out how much smoother-operating, how much longer-lasting these fast-action Bronze Gate Valves can be when Jenkins builds them. Send for the new folder, Form No. 196, containing full details. Jenkins Bros., 100 Park Avenue, New York 17, N.Y. Jenkins Bros., Ltd., Montreal.

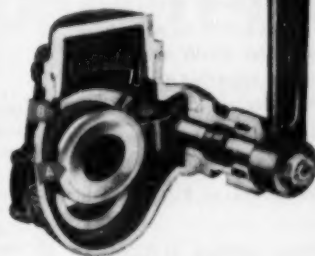
Sold through leading Industrial Distributors



*Jenkins Bros.*



**NO OTHER VALVE  
of its type  
HAS THIS FEATURE**



Notice the guide rims (A) of the discs which rotate freely on the guide tracks (B) cast in the body, as the valve opens or closes. This roller action provides a self-cleaning and polishing effect, and also distributes the wear, since the seating position of the discs changes with each closing. Rapid, uneven wear is prevented, and continuous tight closure assured.

- CLOTH FOR HOT ACID FILTRATION
- CLOTH FOR HOT DUST COLLECTION

**USE CLOTH MADE FROM  
"ORLON" Acrylic Fiber**

**T**his cloth is available in standard width of 38" from stock. We will weave any desired width from 26" through 72" to your order in quantities as low as 100 linear yards.

We have a background of over forty years in weaving industrial fabrics...we weave all of our own Synthetic Fiber Filter Fabrics. We have the "know how" necessary to produce uniform Filter Cloth with outstandingly superior operating characteristics.

Literature and pilot test sample available on request.

Also Weavers of Filter Cloth from:

**GLASS, SARAN, NYLON,  
VINYON† and VINYON N†**

†TM — E. I. duPont de Nemours

†TM — C & CCC

If high operating temperatures are your problem we suggest you try this NFM cloth made from ORLON® Acrylic Fiber. Here are some of its values:

No loss of strength after 32 days exposure to air at 257° F.



Shrinkage not more than 2 1/2 % in water at 212° F.



Good resistance to hot mineral acids, weak alkalies, common solvents, oils, greases, neutral salts, most acid salts and chlorine.



#### NAMES IN THE NEWS, CONT.

of chemical engineering at Massachusetts Institute of Technology, has received an award from the Engineering Societies of New England for his part in the initiation and development of chemical engineering.

Everett P. Partridge, director of research of Hall Laboratories, Inc., and Calgon, Inc., has been named director of Hall Laboratories, Inc.

Wayne E. Kuhn, manager of the technical and research division of the Texas Co., New York, has been awarded the second Honor Scroll of the New York chapter of the American Institute of Chemists. Dr. Kuhn began as a chemist with the Texas Co. in 1929. In 1938 he was named to his present position.



W. E. Kuhn



J. F. Chapin

Jack F. Chapin has been appointed development engineer in charge of product and process engineering for Flexible Tubing Corp., New York. Since completing chemical engineering graduate work at M.I.T. in 1947, he has been a chemical engineer in the research and development division of Pittsburgh Consolidated Coal Co.

Howard K. Nason, director of the central research department of Monsanto Chemical Co., St. Louis, has been appointed assistant to C. A. Hochwalt, vice president and co-ordinator of research, development and patent activities.

W. C. Copeland has been appointed superintendent of the Eagle Point Works of the Texas Co.

Charles C. French, vice president of Virginia Polytechnic Institute, has been appointed dean at A. & M. College of Texas.

Maurice L. Ernsberger has been appointed assistant director of the pioneering research section of E. I. du Pont de Nemours' rayon department. Now located at Buffalo, N. Y., the section will be moved

(Continued)

June 1950—CHEMICAL ENGINEERING



Weavers of Industrial Filter Media for over forty years

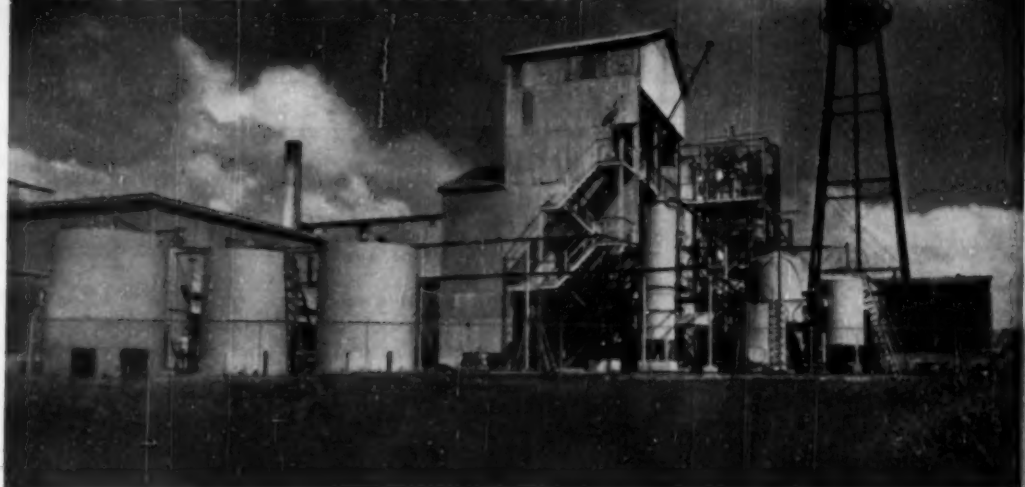
**The National Filter Media Corp.**

General Offices & Mills: New Haven 14, Conn.  
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill. Cincinnati, Ohio Houston, Texas Oslo, Norway Johannesburg, South Africa  
2837 West 19th St. Rouseaux Center Bldg. 1406 Second National Bank Bldg. Wiscasset, Maine Edward I. Bernbaum

**ANOTHER FIRST  
IN SOLVENT EXTRACTION!**



## NEW RICE BRAN PLANT.... ALLIS-CHALMERS EQUIPPED

**Y**ES — HERE'S THE NEWEST in continuous solvent extraction plants . . . the first of its kind in the world. Engineered and equipped by Allis-Chalmers for American Rice Growers Co-operative Association in Houston, Texas, this 30 ton rice bran mill is now in operation.

### A-C SYSTEM PRODUCES OUTSTANDING RESULTS

Four definite advantages resulting from this solvent extraction process have been apparent right from the start. 1) An edible and salable vegetable oil — in quantities to  $7\frac{1}{2}$  tons per day — has been produced from freshly milled rice bran . . . 2) Extracted meal is in great demand as a livestock feed because it has higher protein content than raw bran . . . 3) Extracted bran can be kept indefinitely without danger of turning rancid . . . 4) Wax removed from rice bran by solvent extraction process, and now being lab-tested, may prove to be valuable by-product.

These are the straight facts on a new solvent extraction product — milled rice bran. And Allis-Chalmers has sound, factual information on other vegetable oil products, too — such as soybeans, cottonseed and corn germ . . . products in which A-C has pioneered. Why not discuss *your* solvent extraction possibilities with one of our friendly district office men. There's no obligation.

# ALLIS-CHALMERS

Pioneers in the Field of Continuous Solvent Extraction



Send this handy coupon for illustrated 20-page bulletin and other information on the Allis-Chalmers continuous solvent extraction system.

ALLIS-CHALMERS, 1147A, SO. 70 ST. MILWAUKEE, WIS.	
<input type="checkbox"/> Please send solvent extraction bulletin 1386757A.	
<input type="checkbox"/> Am interested in information on solvent extraction of _____	
<input type="checkbox"/> Please send A-C representative.	
Name _____	
Title _____	
Firm _____	
Address _____	
City _____	State _____
A-2907	



# Problem: How to Handle with Safety Highly Viscous Materials Under Pressure



## Send for This Catalog Now!

The BS&B SAFETY HEAD story is fully covered in a new catalog. Send for your free copy NOW! Use coupon on the opposite page. Once you understand your need for SAFETY HEADS, you won't delay.

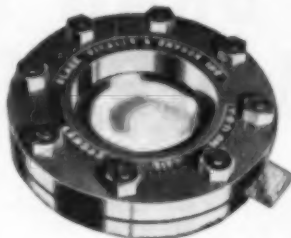
## Free Analysis Without Obligation

Jim Myers, SAFETY HEAD Sales Manager will have a BS&B engineer analyze your pressure relief problems and submit suggestions to you WITHOUT COST OR OBLIGATION. Mail coupon on opposite page or call Gland 4700, Kansas City, Mo. DO IT NOW!

Chemical engineers of many of the nation's largest industrial plants have watched with interest development of the NEW BS&B T-ASSEMBLY SAFETY HEAD. It is already in demand. It is recommended for chemical plants handling viscous materials.

No other relief device acts as quickly as the BS&B SAFETY HEAD. It consists of three principal parts... a pre-formed metal rupture disc and two specially designed holding flanges. Correct element resistant metals are used in fabrication of the rupture disc, which bursts when a predetermined pressure is reached. Instantly a fully unrestricted escape for gases and liquids takes place. And, as quickly the possible dangers of property damage, fires and injuries to personnel vanish.

## Do You need T-ASSEMBLY SAFETY HEADS?



The answer is YES... to every chemical plant using viscous materials under pressure provided the liquid contacts the metal rupture disc. Such plants should not be without this new positive protection relief device. Read the details on "How a T-ASSEMBLY SAFETY HEAD Works" on the opposite page. This newly designed T-Assembly unit is the combined art of the highest achievement of metallurgical and engineering skill.

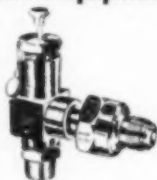
## Here Are Your Answers to Relief Valve Problems--Extra Protection for Expensive Equipment

This installation is used when it is not necessary to have a shut-off or when materials handled are not toxic or inflammable.



A SAFETY HEAD under your relief valve isolates the valve from the vessel contents. This stops leakage through relief valve until SAFETY HEAD disc is burst by overpressure. An open bleed line or some type of tell-tale indicator must be installed in chamber between rupture disc and valve plug.

A SAFETY HEAD at the relief outlet will stop leakage until rupture disc pressure is attained. Not recommended where viscous or corrosive materials might contaminate internal parts of the valve. Investigate your valve design before using this type of installation.

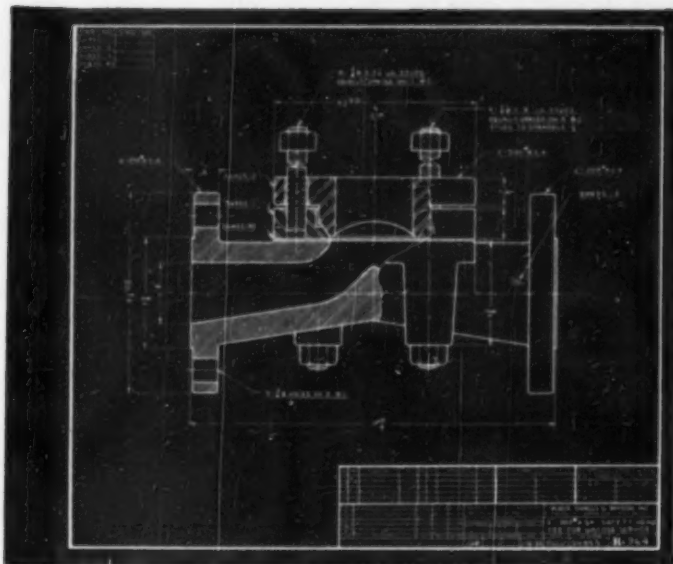


When the SAFETY HEAD is used as secondary relief device you are given positive protection when pressure rises to the predetermined bursting pressure of the rupture disc. The primary relief valve may fail to function due to corrosion, or pressure continues to rise due to inadequate relief area.

# Solution:

# .... BS&B

## T-ASSEMBLY SAFETY HEADS



### How the T-ASSEMBLY SAFETY HEAD Works

The shaded portions of the above diagram indicate a curved channel designed by BS&B through which the viscous material washes against the rupture disc. This material moves on through the passage if no undue pressure rise occurs. However, if the passage becomes blocked, such material will tend to solidify quickly, causing a dangerous pressure rise. In that case, the SAFETY HEAD rupture disc bursts and the pressure is given a fully unrestricted opening.

### BLACK, SIVALLS & BRYSON, INC.

Special Products Division

KANSAS CITY • TULSA • OKLAHOMA CITY

#### BLACK, SIVALLS & BRYSON, INC.

720 Delaware, Sec. 2-5-6, Kansas City, Mo.

☐ Please send me a copy of the new BS&B SAFETY HEAD catalog.

☐ Please have a BS&B SAFETY HEAD engineer analyze my relief problem, without cost or obligation to me.

Name \_\_\_\_\_

Firm \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

Zone \_\_\_\_\_

State \_\_\_\_\_

# BS&B

## SAFETY HEADS

### NAMES IN THE NEWS. cont. . .

to the experimental station at Wilmington as soon as new facilities there have been completed. Dr. Emsberger joined Du Pont in 1936 as a research chemist in the chemical department; he became a group leader and, most recently, research supervisor in which position he is succeeded by John E. Castle.

Clifford Fred Rassweiler's typically American success story has another new chapter. He has just been elected president of Industrial Research Institute, Inc.

Johns-Manville's vice president for research and development was born in 1899 at Polo, Ill., the son of a Methodist minister. His father moved from church to church, first in the Chicago area, then Colorado and Utah. The young Rassweiler developed interests in photography, skiing and public speaking. The family was back in Colorado while he was working his way through college as truck gardener, factory laborer, fruit picker, street car conductor. The year 1920 found him with an A.B. in chemistry from the University of Denver and no job. He decided to study organic chemistry under Dr. Roger Adams at the University of Illinois, where he received his Ph.D.

In 1924, Dr. Adams sent him to the du Pont Experimental Station at Wilmington. His work on the treatment of drying oils, particularly for use with nitrocellulose, played an important part in modifying the Duco used for automobiles so that it could be used in the household. When du Pont organized a laboratory at Philadelphia to apply scientific research methods to the paint, Dr. Rassweiler went along as assistant director. In 1932, he became director.

In 1941 he joined Johns-Manville as director of research and development; was elected to his present post in 1942. He directed an extensive research program during the war and later the erection, near Bound Brook, N. J., of a large research center to develop building materials which could be manufactured to supplement or replace natural products.

Dr. and Mrs. Rassweiler live in Short Hills, N. J., with their two sons, John and James. John is going to Amherst in September to study--yes, chemistry.

D. B. Andrews has been appointed director of the process development department of the Rensselaer, N. Y., plant of General Aniline & Film Corp. He succeeds J. C. Moessinger who is now technical coordinator of the company's foreign activities. Dr. Moessinger re-

(Continued)



*Set to GO with*  
**NETTCO**

## at SALEM OIL & GREASE CO.

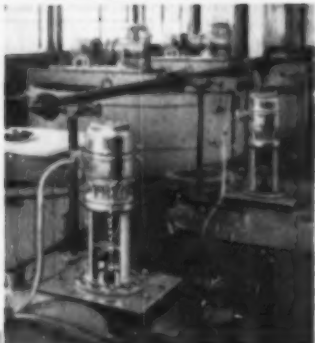
The production of oils and greases to meet exacting industrial requirements calls for efficient agitating equipment. Salem Oil & Grease Co. of Salem, Mass., has employed Nettco Engineered Agitators for over twenty years to meet a wide range of mixing and sulphonating requirements. Here again, Nettco Agitators were selected because they produced the proper mix, conserve time and power, and hold maintenance to a minimum. For information on agitators to meet your own requirements, write **NEW ENGLAND TANK & TOWER COMPANY**, 87 Tileston Street, Everett 49, Mass.



For mixing thick, inert liquids, this Nettco WT-37 Agitator Drive, powered by a 25 HP motor, was selected to thoroughly agitate 4500 gallon batches in tanks 9' diameter, 10' deep. Results: Excellent.



Nettco T-27 drive, Nettco 52A wooden-paddle stirrer, and Nettco-built tank—here's the right combination of standardized units for mixing heavy oils. Motor 5 HP. Tank: 8½' diam., 10' depth, 4000 gals. capacity.



The two special Nettco KG-11 Drives shown in the foreground are designed particularly for installations where the tank headroom is very limited. Employing heavy auxiliary thrust bearings to eliminate bearing overloads in the motor, and incorporating a built-in stuffing box in the mounting flange, these drives offer the best solution where tank size or construction does not permit our standard installation.

**NETTCO** *Engineered* **AGITATORS**

### NAMES IN THE NEWS. CONT.

ceived his Ph.D. from the University of Geneva, Switzerland, 30 years ago, shortly before he came to General Aniline.

Robert H. Kittner has been made production manager of Industrial Rayon Corp., Cleveland. He has been vice president in charge of Glenn L. Martin Co.'s chemical division which he organized in 1944.



R. H. Kittner



J. A. Woods

J. Albert Woods has been elected president of Commercial Solvents Corp., New York. He has been president of Wilson & Toomer Fertilizer Co., a vice president and director of the Armour Fertilizer Works, president of Chilean Nitrate Sales Corp., and a vice president of W. R. Grace & Co.

J. M. Floyd, who has been vice president in charge of manufacturing for the A. O. Smith Corp., Milwaukee, Wis., since 1936, has been named executive vice president. He will take over general operating supervision of the company under the general direction of the president.

Horace Gooch, Jr., has been reelected president of the Society of the Plastics Industry, New York. He is founder and treasurer of Worcester Moulded Plastics Co., Worcester, Mass. Mr. Gooch states that recent indications predict a 10 percent increase in production of plastics raw materials for 1950.

Charles N. Kimball has been elected president and chief executive officer of Midwest Research Institute, Kansas City, Mo. He comes to the Institute from Bendix Aviation Corp., Detroit, where as technical director of the research laboratories, he has been responsible for all technical, financial and administrative matters.

Raymond B. Ladoo, consulting engineer of Newton, Mass., has contracted with the Irish government to study their gypsum deposits and (Continued)

# CALCINING OPERATIONS at ALUMINUM ORE COMPANY

## Demonstrate Effective Utilization of **GAS** for High Temperature Processing

**CALCINATION** is one of the major heat processing operations at Aluminum Ore Company, East St. Louis, Illinois. In huge rotary kilns refined bauxite ores are converted into aluminas, and other chemical compounds by the direct heat method using GAS under precise automatic control.

Over a period of almost 20 years Aluminum Ore Company has used GAS for calcination because this versatile fuel provides the accurate temperatures so essential to the production of uniform materials.

Throughout this time the demands for chemicals derived from bauxite have grown in number and diversity. To meet these re-

quirements the company has developed sixty or more chemicals in addition to its basic alumina.

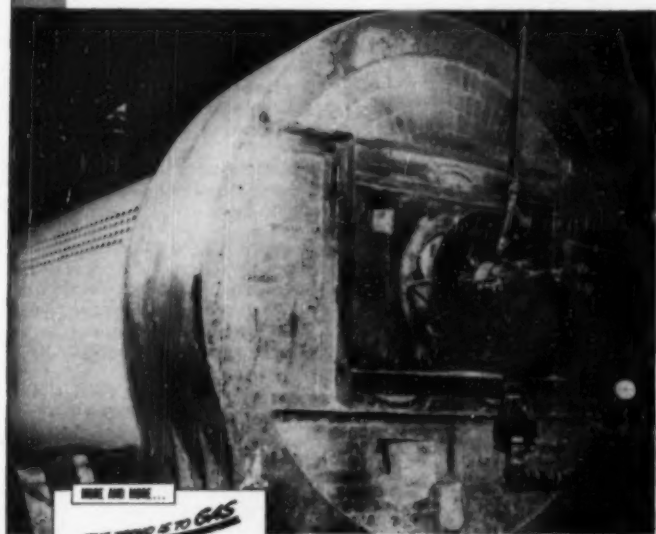
Because it is capable of maintaining the uniform temperatures required for chemical processing GAS continues to serve Aluminum Ore Company—providing clean, automatically controlled heat at just the correct temperature.

Yet, these Alcoa applications represent just a small cross-section of the ways in which GAS can, and does, serve the chemical and metallurgical industries. Your Gas Company Representative will tell you more about them—call him today.

*Firing end of one of the Gas-fired rotary kilns used for converting hydrates into pure alumina, special alumina ores, alumina compounds, et cetera. This kiln converts aluminum trihydrate into aluminum oxide.*



Registered U.S. Pat. Off.  
ALUMINUM COMPANY  
OF AMERICA



### AMERICAN GAS ASSOCIATION

420 LEXINGTON AVE., NEW YORK 17, N. Y.

*White-hot aluminum oxide being discharged from kiln into conveyor.*





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Karat Golds. Fine Gold Anodes.



Fine, Sterling and Coin. Sheet, Wire, Circles and Foil.

Fine Silver Anodes. Rolled, Cast or in Shot Forms.

Silver Brazing Alloys and Fluxes for every industrial requirement.

### NAMES IN THE NEWS. CONT. . .

other raw materials. The three-month project is aimed at furthering their industrialization program.

**Champion H. Mathewson** has retired as head of the Yale department of metallurgy, a position he has held since 1919. A pioneer in the science of metallography, Mr. Mathewson was responsible for the founding and development of Yale studies in this field.

**Ferdinand B. Zienty** has been made associate director of the St. Louis research department of the organic chemicals division of Monsanto Chemical Co.

**Donald J. MacLaurin** has been appointed research associate and chief of the pulping section of the Institute of Paper Chemistry. He has been technical director for Powell River Co., Ltd., for the past year.

**Frank B. Jewett** has been posthumously awarded the 1950 Medal of the Industrial Research Institute, Inc. For many years vice president of the American Telephone and Telegraph Co., president of Bell Telephone Laboratories and of the National Academy of Sciences, he received the award for outstanding accomplishment in the management field of industrial research.

**H. W. Prentis, Jr.**, has retired as president of Armstrong Cork Co., Lancaster, Pa.

**Robert W. Lea**, president of Johns-Manville Corp. and F. S. Elfred, general manager of the explosives division of Olin Industries, have been elected to the board of directors of Olin Industries, Inc., East Alton, Ill.

**Bernard N. Larsen** has been appointed development engineer and technical service representative for rubber chemicals for the Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

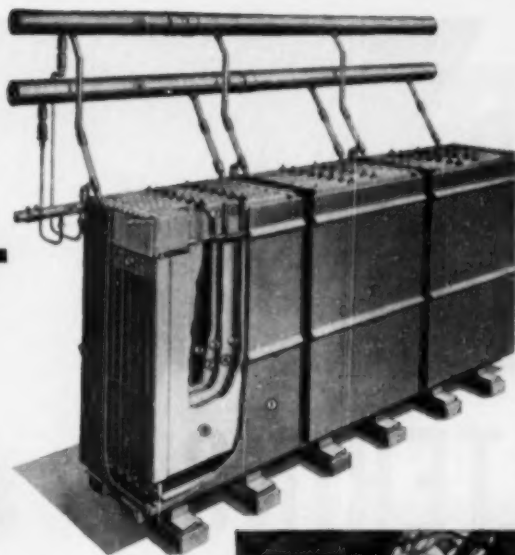
**Carl E. Johnson** has been elected board chairman of Sterling Electric Motors, Inc., New York. **Earl Mendenhall** succeeds him as president. The two men, associated for over 34 years, have been granted some 200 patents in the field of electric power drives.

**Louis M. Levy**, a chemical engineer with the Mound Laboratory of  
*(Continued)*

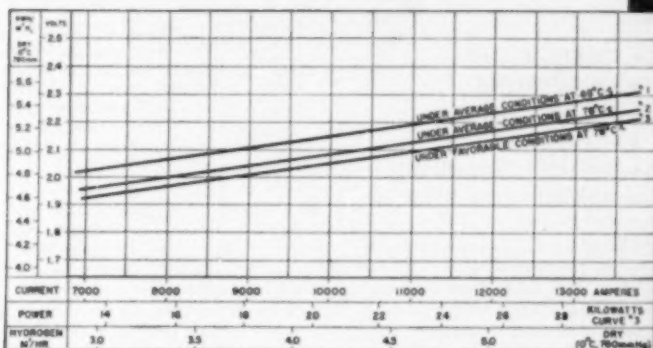


# CHEMICO can now supply HYDROGEN- OXYGEN CELLS

**AT LOW COST**



- 1 Tank
- 2 Cathode
- 3 Diaphragm
- 4 Anode
- 5 Electrical Terminal
- 6 Oxygen Collector
- 7 Hydrogen Collector
- 8 Feed Water Line
- 9 Oxygen Man
- 10 Hydrogen Man



## Note these important advantages:

1. Low initial cost—low maintenance cost.
2. Diaphragms held rigidly in frames to prevent flapping thus greatly increasing the life of the material.
3. Cathodes readily removable for easy cleaning without disturbing remaining components of cell.
4. Interchangeable parts simplify maintenance.
5. Low power consumption.
6. Compact design—requires less floor space.
7. Fully automatic operation.
8. Single connectors between cells simplify dismantling and assembly.
9. Safety design virtually eliminates explosion hazard.

These outstanding results are achieved by standardization of an advanced type of cell built to one unit size of

10,000-ampere loading. These cells can be operated at any power loading up to rated capacity. In fact, operations below rated capacities result in important power economies. Installations are practical at rates as low as 500 cu ft per hr.

Chemico hydrogen-oxygen electrolytic cells are available for immediate delivery. Write for quotations, stating your conditions and requirements.

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- EASY TO CLEAN
- FREE, EASY FILTRATE DISCHARGE
- EXCEPTIONALLY LONG SERVICE LIFE

Check these operating advantages found in Newark Stainless Steel Filter Cloth. They may suggest the solution to one of your special filtering problems or they may be the answer to your need for a backing cloth that will really stand up through tough, corrosive filtering cycles.

Newark Stainless Steel Filter Cloth is easily adapted to practically all types of filters and is available in a wide variety of weaves. When writing please give us details on your process.

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New Catalog D.

## Newark Wire Cloth COMPANY

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### NAMES IN THE NEWS, cont. . .

Monsanto Chemical Co. at Miamisburg, Ohio, has been appointed visiting professor of chemical engineering at the University of Antioquia, Medellin, Columbia, South America.

Charles W. Kaufman has been named to succeed the late T. M. Rector as head of the General Foods department of research and development. Mr. Kaufman joined General Foods Central Laboratory staff in Hoboken in 1939. He was named director of food technology in 1942 and assistant manager of research and development three years later.

William B. Hardy has been appointed a sectional director in the chemical research department of the Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J. He was formerly a group leader, primarily responsible for developing a new line of soluble vat dyes.

Roy C. Ingersoll has been elected president of Borg-Warner Corp., Chicago. He succeeds C. S. Davis who has been elected to the newly created office of chairman of the board. G. A. Shallberg, previously executive vice president, has been named chairman of the executive committee.

A. F. Endres, formerly assistant general superintendent, has been made general superintendent of the Whiting, Ind., refinery of Standard Oil Co. (Indiana). He succeeds M. R. Schmidt, who has retired after 32 years' service. Mr. Endres first came to the refinery in 1923 as a chemical engineer in the research department; he is a University of Illinois graduate.

Lloyd K. Riggs has been appointed director of the newly formed division of nutrition and biochemistry of National Dairy Research Laboratories, Inc., Oakdale, L. I., N. Y.

John A. MacLaughlin has retired as commanding officer of the Army Chemical Center's Technical Command in Maryland. He has been instrumental in setting up the University of Maryland's graduate school conducted on the post for scientific civilian employees.

Ivan Peches, director of research for the plate glass works of the St. Gobain Co., Paris, France, has been named winner of the second annual

(Continued)

# 12

## BASIC CHEMICALS

ALL produced by

# MATHIESON

PRODUCED BY OTHER CHEMICAL COMPANIES

PRODUCT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
(MATHIESON)																		
SULPHURIC ACID	✓	✓				✓			✓			✓			✓	✓		
PROCESSED SULPHUR	✓												✓			✓		
SODA ASH	✓			✓						✓	✓						✓	✓
CAUSTIC SODA	✓			✓	✓		✓	✓	✓	✓	✓				✓	✓	✓	✓
BICARBONATE OF SODA	✓			✓						✓	✓							✓
AMMONIA	✓		✓		✓				✓			✓		✓	✓			
AMMONIUM SULPHATE	✓		✓									✓						
NITRATE OF SODA	✓		✓															
CHLORINE	✓			✓	✓		✓	✓	✓	✓	✓				✓	✓	✓	✓
CALCIUM HYPOCHLORITE	✓								✓	✓								
SODIUM CHLORITE	✓																	
CHLORINE DIOXIDE	✓																	

This inclusive selection of basic chemicals—all available from one reliable source of supply—enable Mathieson customers to simplify their purchasing procedures. They benefit further by obtaining chemicals of outstanding purity.

These are but two of the many specific reasons it will pay you to check with Mathieson before ordering any heavy chemical. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

**Mathieson**  
CHEMICALS

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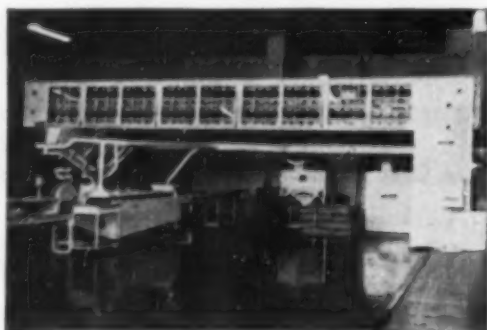
SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

CHEMICAL ENGINEERING—June 1950

253

# ROTO-CLONE

## converts flour dust into "dough"



### Bakery solves sanitation problem and reclaims 230 lbs. of flour daily

**C**OMMERCIAL bakeries have a major maintenance problem. Air-borne flour dust coats equipment, floors and walls. Good sanitation practices dictate the removal of this dust immediately and it costs an average bakery plenty over a year's time.

And here's how a Phoenix, Ariz., bakery solved the problem. At rear and center of the bakery you see an AAF Type D ROTO-CLONE® and Airmat Arrester. The ROTO-CLONE removes the flour dust as it is released at the blender, rounder, proofer, molding unit and pan conveyor. The flour dust is collected in a hopper beneath the ROTO-CLONE and the air is then exhausted through the Airmat Arrester for final cleaning before being recirculated to the workroom.

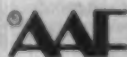
Results—high sanitary standards maintained continuously at greatly reduced cost and 230 lbs. of flour (formerly a total loss) are reclaimed daily.

Dust is the enemy of all industry. Whether you make bread, chemicals, or castings, ROTO-CLONE dust control equipment can help you improve working standards and reduce maintenance costs. There's a size and type to solve every problem. For complete information, call your local AAF representative or write—

### AMERICAN AIR FILTER COMPANY, INC.

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**ROTO-CLONE®**  
DUST CONTROL EQUIPMENT

\*ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.

### NAMES IN THE NEWS, cont. . .

Ross Coffin Purdy Award of the American Ceramic Society. Dr. Peyches is being honored for his paper, "The Principles Underlying the Electric Melting of Glass."

Robert B. Beckman has been promoted to associate professor of chemical engineering at Carnegie Institute of Technology. Before joining the faculty in 1946, he was a research chemist with Humble Oil and Refining Co., Baytown, Tex.

J. Robert Roach and J. Robert Coffman have been appointed section heads for General Mills Research Laboratories, Minneapolis. Dr. Roach will head the foods research; Dr. Coffman will head the newly-formed starch-gluten section.

J. M. Robbins has been elected vice president in charge of manufacturing of B. F. Goodrich Rubber Co. of Canada, Ltd. He succeeds B. M. Costello who became vice president in charge of manufacturing of International B. F. Goodrich.

Timothy H. Murphy has retired as Second Army Chemical Officer. A veteran of World Wars I and II, Col. Murphy has had over 30 years of service.

J. A. H. Henderson has been elected president and Dr. A. Pouliot vice president of the Corp. of Professional Engineers of Quebec.

E. K. Rideal and Granville Tyser have been appointed to the board of directors of Monsanto Chemicals Ltd., London.

William H. Darnell, June chemical engineering graduate from Virginia Polytechnic Institute, has been selected by Tau Beta Pi for a graduate fellowship award in 1950-51.

George E. Frost has been appointed manager of the newly-created products service division of Winchester Repeating Arms Co., New Haven, Conn.

John Gamble Kirkwood of the California Institute of Technology has been awarded the 1950 Theodore William Richards Medal by the northeastern section of the American Chemical Society. His contributions have aided in the development of statistical mechanics and have been of practical importance (Continued)

# TO DO A BETTER PIPING JOB...



## USE **GLOBE** PRECISION PROCESS SEAMLESS WELDING FITTINGS

Your preference for Globe Welding Fittings is supported by a source of supply with exceptional qualifications. Specialized metallurgical experience and facilities gained in years of steel tubing manufacture enable Globe to produce welding fittings by a precision process that yields a superior product.

Send for the Globe Welding Fittings Catalog No. 501.

GLOBE STEEL TUBES CO., Milwaukee 15, Wisconsin  
Chicago — Cleveland — Detroit — New York — Philadelphia — St. Louis  
— Tulsa — Houston — Denver — San Francisco — Glendale, Calif.

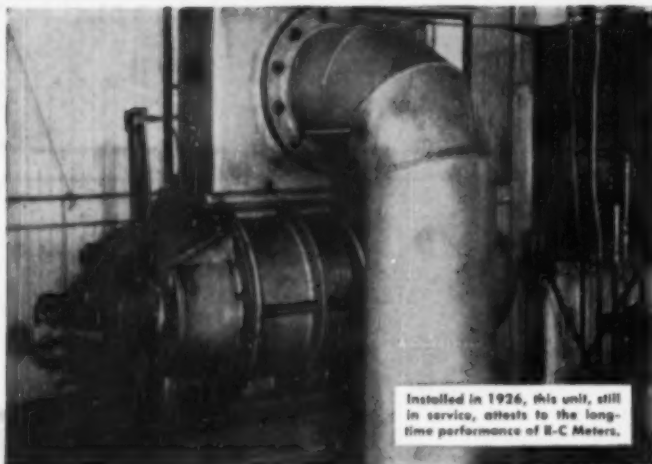
SIZE RANGE OF GLOBE SEAMLESS WELDING FITTINGS

Description of Fitting	Standard Weight (Schedule 40)	Extra Strong (Schedule 80)	(Schedule 160)	Double Extra Strong
Elbows 45° Long Radius	½ in. to 24 in.	¾ in. to 24 in.	1 in. to 12 in.	1 in. to 8 in.
Elbows 90° Long Radius	½ in. to 24 in.	¾ in. to 24 in.	1 in. to 12 in.	1 in. to 8 in.
Elbows 90° Short Radius	1 in. to 24 in.	1½ in. to 24 in.	— — —	— — —
Returns 180° Long Radius	½ in. to 24 in.	1 in. to 24 in.	1 in. to 12 in.	3 in. to 8 in.
Returns 180° Short Radius	1 in. to 24 in.	1½ in. to 24 in.	— — —	— — —
Reducers (Concentric and Eccentric)	1 x ¼ in. to 24 x 20 in.	1 x ¼ in. to 24 x 20 in.	1 x ¼ in. to 12 x 10 in.	1 x ¼ in. to 12 x 10 in.
Tees Straight	½ in. to 24 in.	¾ in. to 24 in.	1 in. to 12 in.	1 in. to 8 in.
Tees Reducing Outlet	½ in. to 24 in.	¾ in. to 24 in.	1 in. to 12 in.	1 in. to 8 in.
Stub Ends Lap Joint	1 in. to 24 in.	1 in. to 24 in.	— — —	— — —
Caps	1 in. to 24 in.	1 in. to 24 in.	1 in. to 12 in.	1 in. to 8 in.

Producers of Globe Seamless Stainless Steel Tubes  
— Gloweld Welded Stainless Steel Tubes—Carbon  
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Seamless High Purity Ingot Iron Tubes and Pipe.

Flanges available 1 inch to 24 inches in all weights





Installed in 1926, this unit, still in service, attests to the long-time performance of R-C Meters.

## NO PENSION FOR THIS OLD-TIMER even after 23 years of service

Accurate and dependable as always, this 23-year-old Roots-Connorsville Meter still performs faithfully. No retirement for this veteran! Because new demands called for higher capacity, it has been transferred to another job in the same plant. Its old duties have been taken on by a new R-C unit, purchased because of fine performance of this old-timer.

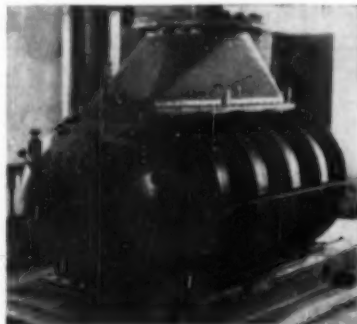
That's a common history of R-C Meters. They're built to measure accurately, and keep on doing it, year after year. Simple design, finely machined measuring surfaces and other important refinements account for their ability to measure gas accurately and unfailingly, almost indefinitely.

With 31 standard sizes and capacities from 4,000 to 1,000,000 cfm, R-C Meters meet the needs of most applications. Write for Bulletin 40-B-14 or tell us your specific requirements.

**ROOTS-CONNERSVILLE BLOWER CORPORATION**  
506 Illinois Avenue, Connorsville, Indiana

(Right) This R-C Meter, with capacity of 317,000 cfm, replaced the "old-timer" above, now transferred to other duties.

(Below) Typical small capacity R-C Meter for low and medium pressures.



# ROOTS-CONNERSVILLE

ONE OF THE DRESSER INDUSTRIES



### NAMES IN THE NEWS, CONT.

in the study of the transfer of heat.

**Philip L. Southwick** has been promoted to associate professor of organic chemistry at Carnegie Institute of Technology. Before joining the faculty in 1946, Dr. Southwick was a research chemist for Merck and Co.

**William T. Hack** has been appointed manager of the product development department of the Ethyl Corp., New York. He has recently been director of the chemical and rubber division of the National Security Resources Board, Washington, D. C.

**B. E. Sawyer** has been appointed sales manager of Chemical Engineering and G. E. Riddell sales manager of Food Industries, both McGraw-Hill publications.

**Carl Pacifico**, formerly with the new products division of Publicker Industries Inc., Philadelphia, has joined the development department of Wyandotte Chemicals Corp., Wyandotte, Mich.

**Roman Smoluchowski** has been promoted to professor of metallurgical engineering at Carnegie Institute of Technology.

**E. V. Murphree**, president of Standard Oil Development Co., has been elected to membership in the National Academy of Sciences.

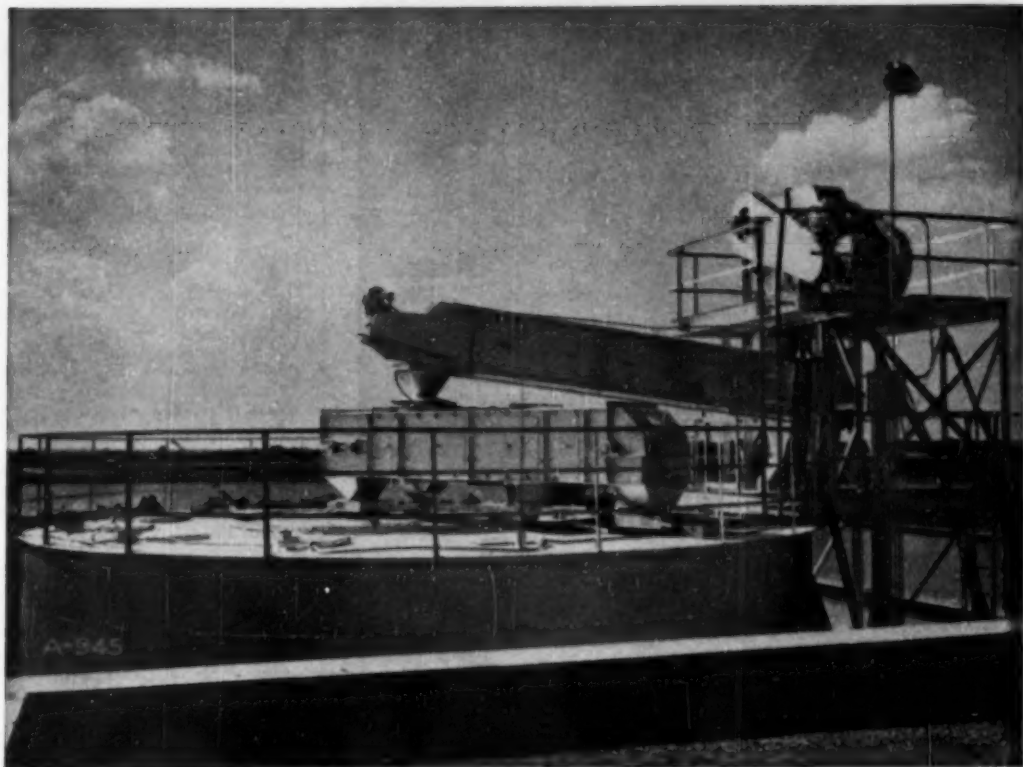
**C. H. Robson** has been named manufacturing engineer of the chemical department of General Electric's Coshocton, Ohio plant.

**William J. Burkett**, graduate of the University of Texas, and **L. Bakker**, who has had 12 years with the Shell Oil Co. in Europe, have been added to the chemical engineering department of the Southwest Research Institute, San Antonio, Tex.

**George Calingaert**, associate director of research of the Ethyl Corp., Detroit, has been appointed professor of chemistry at Hobart and William Smith Colleges, Geneva, N. Y.

**William E. Hake**, chemist and technical writer, has joined the technical literature department of Ketchum, MacLeod & Grove, Inc., Pittsburgh advertising and public relations agency.

**Richard E. Hulme**, formerly with the  
(Continued)



## TRIPLE PLAY—Unassisted

Unloading bulk chemicals from cars with minimum manual operation—conveying them horizontally and elevating—distributing to any designated one of fifteen silo sections—These were the basic elements of this complex materials handling problem. Protection against weather was essential . . . and facility for quick reclaiming. Low handling cost per ton was a must. A single engineered S-A bulk handling system proved to be the perfect answer for efficiency and economy.

In S-A's complete line of conveying equipment—plus 50 years' experience—S-A engineers have the "tools" to develop all types of bulk materials handling systems at minimum cost. Whatever your needs and materials may be—it will pay you to get the recommendations of S-A engineers. A discussion does not obligate you. Write today!

CITY OF DALLAS, TEXAS  
Municipal Water Purification Plant  
J.G. Bartholomew Co., Gen. Contractor

From an S-A car unloader, a 48-foot long REDLER conveyor carries four different materials under the silo to the base of a 67-foot high loop-hoist REDLER elevator. This unit elevates to top of silo where a pivoted REDLER conveyor on circular track discharges into fifteen storage compartments. Materials also can be diverted to a horizontal closed-circuit REDLER which moves them to the building where chemicals, stored in tanks, feed directly to the water purification process. Chemicals in silo are easily reclaimed and returned to the REDLER handling system. Most of the handling equipment is outdoors. Sealed REDLER casing keeps chemicals free from contamination, protects against weather and prevents waste by spillage.

**STEPHEN S-A DAMSON**

3 Ridgeway Avenue, Aurora, Illinois AFG. CO. Los Angeles, Calif. • Belleville, Ontario

**DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT**

CHEMICAL ENGINEERING—June 1950

257



## CLARK in the CHEMICAL Industry

**A SURE-FIRE WAY TO GET MORE FOR YOUR MONEY—CLARK FORK TRUCKS**

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Lower your break-even point—by cutting those handling costs with the versatile, efficient, and economical Clark Machines

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Many practical handling attachments broaden the usefulness of Clark fork trucks—good idea to know about them

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ZONE \_\_\_\_\_ STATE \_\_\_\_\_

CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

#### NAMES IN THE NEWS, cont. . .

development department of Diamond Alkali Co., Painesville, Ohio, has opened a consulting office in Bradford, Pa. In his six years with Diamond Alkali he developed a magnesium oxide process, a method of dehydrating caustic soda, a method of recovering liquid chlorine from purge gas.

#### OBITUARIES

Merle Randall, 62, professor emeritus of chemistry of the University of California, Berkeley, died March 17.

Stephen A. Brooks, 54, president of the Brooks Rotameter Co., Lansdale, Pa., died in Jamison, Pa., March 29.

Kent M. Sprinkel, 46, co-owner of Deeks and Sprinkel Co., chemical brokers of Louisville, Ky., died April 11.

Henry M. Smith, 82, who taught chemistry at Syracuse University, Massachusetts Institute of Technology and conducted research at the Carnegie Institute for many years, died at Boston April 12.

Herbert M. Martin, 57, dean of the school of chemistry of Alabama Polytechnic Institute, Auburn, Ala., died April 16.

David R. Sperry, 67, president, D. R. Sperry Co., Batavia, Ill., died April 16.

Charles D. Sproule, vice president, Pratt & Lambert, Chicago, died in Buffalo April 24.

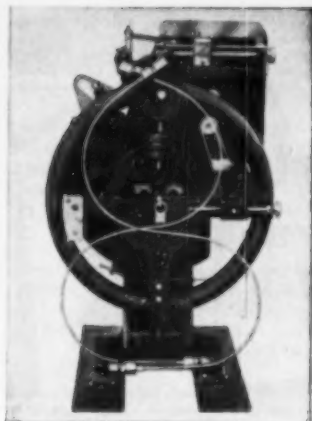
William H. Gabeler, 58, manager of the phosphate rock division of The Davison Chemical Corp., Baltimore, died in Bartow, Fla., April 29.

Raymond C. Benner, 58, government engineering consultant, patent lawyer, inventor and former research director of the Carborundum Co., died in Cleveland April 30.

Charles R. Scott, Sr., 57, secretary of the Hylco Co., died in Houston May 1.

Oscar F. Smith, 56, president of Smith-Douglas Fertilizer Co., died at Sedgfield, N. C., May 4.

Edwin S. Webster, 82, cofounder and former chairman of Stone and Webster Inc., New York, died in Chestnut Hill, Mass., May 10.



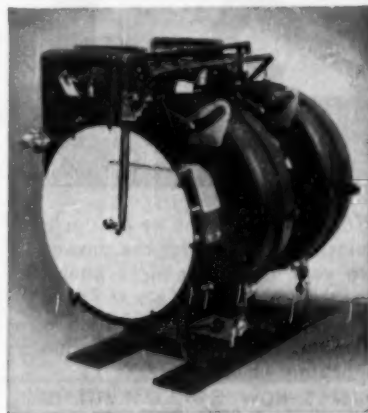
Rear View of Hagan Ring Balance Meter with single high-differential ring. Integrator is at upper right.

# with **HAGAN** RING BALANCE METERS



Dual Meter case occupies same panel space, and is only 5 inches deeper than single-ring case.

Same orifice . . .  
same meter body . . .  
full scale differential  
*continuously adjustable from*  
*20 to 140 inches*



Hagan Dual Meter with two low differential rings. Integrator can be provided for each ring if desired.

The Hagan Ring Balance Flow Meter is not a "fixed-head" meter but can be adjusted to accommodate a change of as much as 7 to 1 in maximum head—with full scale chart reading.

This is accomplished by a spring resistance system which is adjusted by a simple range screw. Especially at low flows, this system gives high accuracy in the conversion of differential head to pen movement.

Other models of this meter are available for heads of two inches or lower, and up to 420 inches—and each has this same easy adjustability.

For full information on these meters, or on any application in which you are interested, write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pennsylvania.



## **HAGAN CORPORATION**

RING BALANCE FLOW AND PRESSURE INSTRUMENTS  
THRU-ROD FORCE MEASURING DEVICES  
BOILER COMBUSTION CONTROL SYSTEMS  
METALLURGICAL FURNACE CONTROL SYSTEMS

# TEFLON PACKING

resists  
all  
chemical  
action!



**PREVENTS COSTLY  
SHUTDOWNS!**

Turn to Teflon, the new miracle plastic material, for the answer to your every chemical pump-packing problem. Turn to Power Products Co., a specialist in Teflon, for the best in Teflon packing.

HERE'S HOW TEFLON HELPED WESTERN ELECTRIC. The Western Electric Co., plant at Allentown, Pa., has been using Power Products (Teflon) Packing on a pump handling saturated ethylene diaine tartrate solution since April 1948, with no noticeable deterioration . . . A performance rating unheard of with conventional packing. Use type #101 (graphite) on all except stainless steel valves and pumps. On stainless steel use #201 (mica).

The Power Products Co., also makes Teflon covered, and solid Teflon gaskets and welcome inquiries about unusual shapes and custom made items.



11 Broadway, New York 4, N. Y.

## INDUSTRIAL NOTES

### NEW FACILITIES

**Continental Carbon Co.,** New York—A Houston, Tex., office for its carbon black division, to be headed by John H. Wishnick.

**Allegheny Ludlum Steel Corp.,** Pittsburgh—A laboratory near Brackenridge, Pa., for metallurgical research into high alloy and other specialty steels. Built of stainless curtain walls, the laboratory will be erected within the next three years.

**American Cyanamid Co.,** New York—A dyes and chemicals export department to handle foreign activities in connection with the products of the Calco Chemical Division, industrial chemicals division and plastics and resins division. It will be headed by Fraser M. Moffat, Jr.

**Philadelphia Quartz Co.,** Philadelphia—A laboratory in Philadelphia for fundamental research on soluble silicates.

**Pittsburgh—**A manufacturing division to accommodate the demands for fabrication of specially engineered equipment for the chemical, petroleum, food and allied industries.

**Acheson Colloids Corp.,** Port Huron, Mich.—A New York office for its dispersed pigments division to advise manufacturers on how to work with colorants.

**Wagner Electric Corp.,** St. Louis—A new sales territory with headquarters in Memphis and a sales office in New Orleans.

**Pure Carbonic Co.,** New York—A dry ice warehouse and cylinder filling plant in Richmond, Va.

**Chiksan Co.,** Brea, Calif.—A warehouse stock in Newark, N. J. Consequently, eastern headquarters have been transferred from New York to Newark.

**Bathurst Power and Paper Co.,** Bathurst, N. S. W., Australia  
(Continued)

## ONLY ONE MOVING PART..

A small, stainless steel valve that floats on the condensate load . . . keeps maintenance at a minimum. Continuous discharge under heavy loads, frequent under light loads, gets equipment hotter, sooner and keeps it hot. Over 600,000 Yarways already installed. Sold by distributors throughout the world.

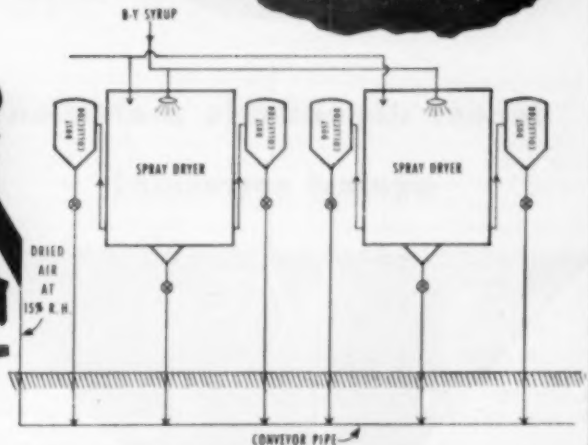
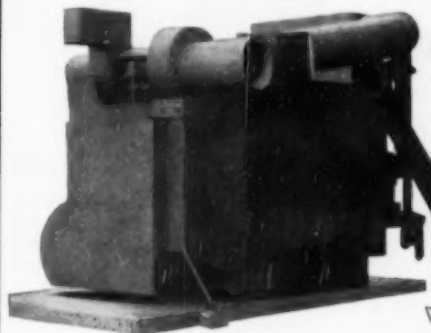


**YARNALL-WARING CO.** 137 MERMAID AVENUE, PHILA. 18, PA.



# **DRY AIR FED TO CONVEYOR** during manufacturing process **KEEPS B.Y. FLOWING FREELY**

One of two Lectrodryers supplying DRY air to an underground conveyor at Commercial Solvents Corporation's plant at Peoria, Ill.



The free-flowing property of Commercial Solvents' B.Y. is extremely important to manufacturers of livestock and poultry feeds. This dry, mill-ground meal mixes smoothly and uniformly, and doesn't lump up, because it comes to them DRY.

Gathered in dust collectors at the spray and drum dryers, B.Y. passes through a 6-inch underground conveyor pipe to the bagging and blending building. There's no chance for the dry powder to pick up moisture enroute, because two Type

CH Lectrodryers feed DRY air into the conveyor. B.Y. goes into the bags DRY.

Lectrodryers are similarly serving hundreds of companies where hygroscopic materials are handled—maintaining product quality, speeding up manufacturing operations and reducing manpower requirements. Costs are consequently less.

Bulletin 216 shows how other companies are using Lectrodryers. For a copy, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.  
 In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.

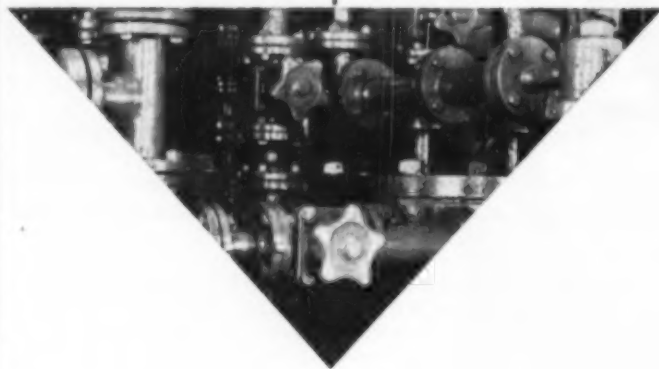
**LECTRODRYERS DRY  
 WITH ACTIVATED ALUMINAS**

## **LECTRODRYER**

REGISTERED TRADEMARK U. S. PAT. OFF.



**means dependable protection  
against corrosion!**



For the dependable protection against corrosion that assures you of long-term operation at a minimum maintenance cost—specify *saran lined steel pipe*. Saran's unusual resistance to most chemicals and solvents plays an important part in the reduction of shutdowns and lost production. Another noteworthy advantage is its ease of field fabrication—involving NO costly delays with

special tools or handling. Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches. Also available are saran lined diaphragm valves, plug valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed by Saran Lined Pipe Company, Dept. TSP-29.

<p><small>Distributed by</small></p> <p><b>Saran Lined Pipe Company</b></p> <p><small>701 STEPHENSON BUILDING • DETROIT, MICHIGAN</small></p> <p><small>Offices in: New York • Boston • Philadelphia • Pittsburgh</small></p> <p><small>Chicago • Tulsa • Indianapolis • Houston • San Francisco</small></p> <p><small>Los Angeles • Portland • Cleveland • Denver • Seattle</small></p> <p><small>Charleston, S. C. • Toronto</small></p>	<p><b>SARAN LINED PIPE</b></p> <p><b>product</b></p>
--	--

#### INDUSTRIAL NOTES, cont. . .

urst, New Brunswick, Canada—A "chemi-pulp" unit to produce high-quality paperboard from waste hardwoods.

**Portland Shingle Co.**, Portland, Ore.—A plant to manufacture a boiler treatment from waste products of shingle mills. When completed the plant will have 100 bbl. a day capacity.

**Leeds & Northrup Co.**, Philadelphia —A sales and service office in Seattle. Stratford B. Biddle, Jr., is manager.

**DeVilbiss Co.**, Toledo—An assembling, warehousing and distributing plant in Santa Clara, Calif.

**Societe Industrielle Belge des Petroles** —A 30,000 bbl.-per-day refinery at Antwerp, Belgium, scheduled for completion in mid-1951. M. W. Kellogg Co., Jersey City, N. J., has already completed the process and design engineering.

#### NEW LINES

**Edwal Laboratories, Inc.**, Ringwood, Ill., has added other commonly used coating ingredients to its line of coating chemicals for diazotype reproduction.

**Hardinge Co.**, York, Pa., has acquired exclusive manufacturing and sales rights for Kuntz lime and hydrate equipment from Ellicott Machine Corp. of Baltimore.

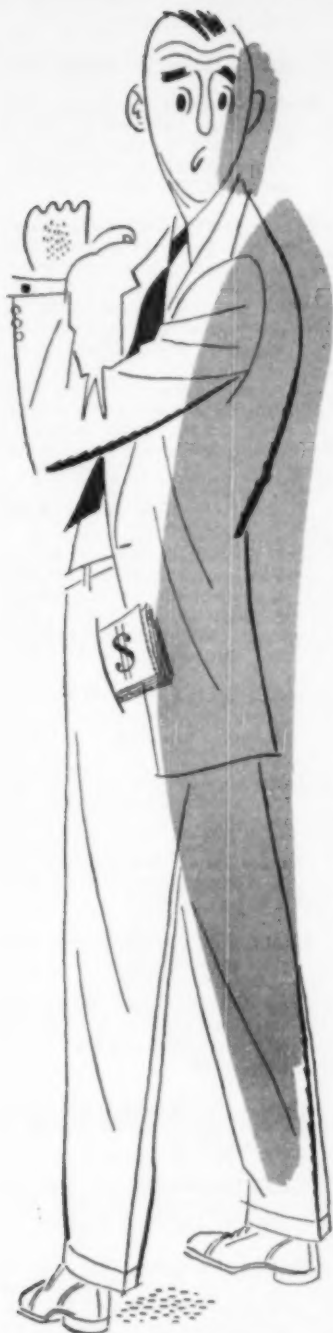
**Aircraft Specialties Co.**, Hicksville, N. Y., has formed a new division to manufacture a cellular cellulose acetate, an expanded plastic material made in an extrusion process, under license agreement with E. I. du Pont de Nemours & Co.

**Koppers Co.**, Pittsburgh, will manufacture and market a line of adhesives developed by Emlenton Resins Co., Emlenton, Pa.

**St. John X-Ray Laboratory**, Califon, N. J., has been authorized by the A.E.C. Isotopes Division, Oak Ridge, Tenn., to handle Cobalt 60 on a rental basis.

**Whiting Corp.**, Harvey, Ill., has taken over the belt and chain conveyor business formerly operated as the Coburn-Foster Conveyor Co., Chicago. The equipment will be manufactured at the Whiting plants at

(Continued)



## WHO, ME, A PRESSURE SPENDTHRIFT?

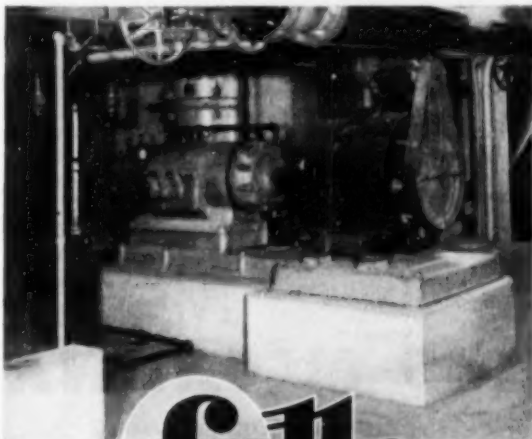
**Let FULLER ROTARY COMPRESSORS supply just the pressure you need . . . WHERE you need it.**

Sure, you need large, high pressure units to supply pressures equal to the demands of certain operations. But it costs plenty to compress air for these uses . . . and then have to reduce pressure from 10 to 50 lb. for some other task. That's why more and more plants throughout the country have adopted the economical plan of "spotting" Fuller Rotary Compressors wherever air is needed . . . at pressures up to 125 psig . . . supplying *only* the pressure required for most efficient work.

Fuller Rotary Compressors have few moving parts . . . the rotor, bearings and blades. They're fully dependable . . . need only infrequent inspection. There are no valves to leak or seats to grind. They're readily accessible. Blades automatically compensate for wear. *Full capacity is maintained for the life of the machine.* They're engineered for a full life-time of new machine efficiency.

If you're interested in dependable, more economical operation, get in touch with a Fuller engineer. He'll show you how you can be sure of getting just the pressure you want, where you want it . . . how you can cut installation and maintenance costs while you boost operating efficiency. There's no obligation, of course.

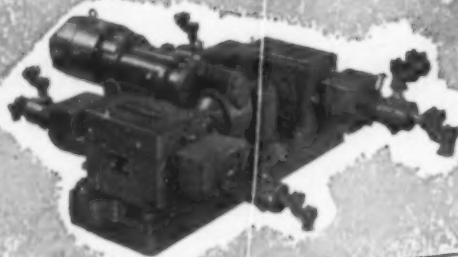
FULLER COMPANY, Colasque, Pa. • 129 S. LaSalle St., Chicago 3 • 429 Chancery Bldg., San Francisco 4



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COMPRESSORS AND VACUUM PUMPS  
FEEDERS, AND ASSOCIATED EQUIPMENT

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*offers such complete  
dependability and  
freedom from maintenance*

**T**HE NEW Hills-McCanna "K" Type Pump offers a whole new conception of metering and proportioning. A simple straight-line enclosed hydraulic drive submerged in an oil bath replaces the complex mechanical linkages found in most pumps. Built-in overload relief makes it impossible to damage motor or mechanism by inadvertent overloading. Horizontal cylinders with twin checks reduce danger of air binding and can be easily disassembled for cleaning without dismantling piping. Stroke may be adjusted quickly and easily, from zero to full capacity, even while the pump is operating. Just compare and you'll see why "K" pumps are more dependable and require practically no maintenance.

Hills-McCanna "K" Type Pumps have capacities to 300 gph per feed and pressure ratings up to 25,000 psi. Write for full details. **HILLS-McCANNA CO., 2341 W. Nelson Street, Chicago 18, Illinois.**

## **HILLS-McCANNA**

*metering and proportioning*  
**pumps**

**Saunders Patent Diaphragm Valves**

### INDUSTRIAL NOTES, cont. . .

Harvey, Ill., and Los Angeles, Calif.

Buell Engineering Co. has acquired rights from the Swedish General Electric Co. to manufacture and sell the Swedish electrical dust precipitator in this country.

Learepeater Corp. of America, headed by Elmer Crane of Cleveland, Ohio, has acquired the exclusive license to manufacture and sell a new electron tape device developed by the Los Angeles laboratories of Lear, Inc., Grand Rapids, Mich.

Golwynne Chemicals Corp., New York, has acquired a line of super refractories by taking control of Mullite Refractories Co., Shelton, Conn.

### NEW LOCATIONS

E. I. du Pont de Nemours & Co., Wilmington, has moved the Chicago district office of its petroleum chemicals division to Willoughby Tower, No. 8 South Michigan Blvd., Chicago.

Sylvania Electric Products Inc. has moved its headquarters to 1740 Broadway, New York.

Quaker Oats Co. has moved its Chicago general office to Merchandise Mart Plaza.

National Foam System Inc. has moved its Philadelphia offices to its plant at West Chester, Pa.

Ethyl Corp. has moved its New York office to 100 Park Ave.

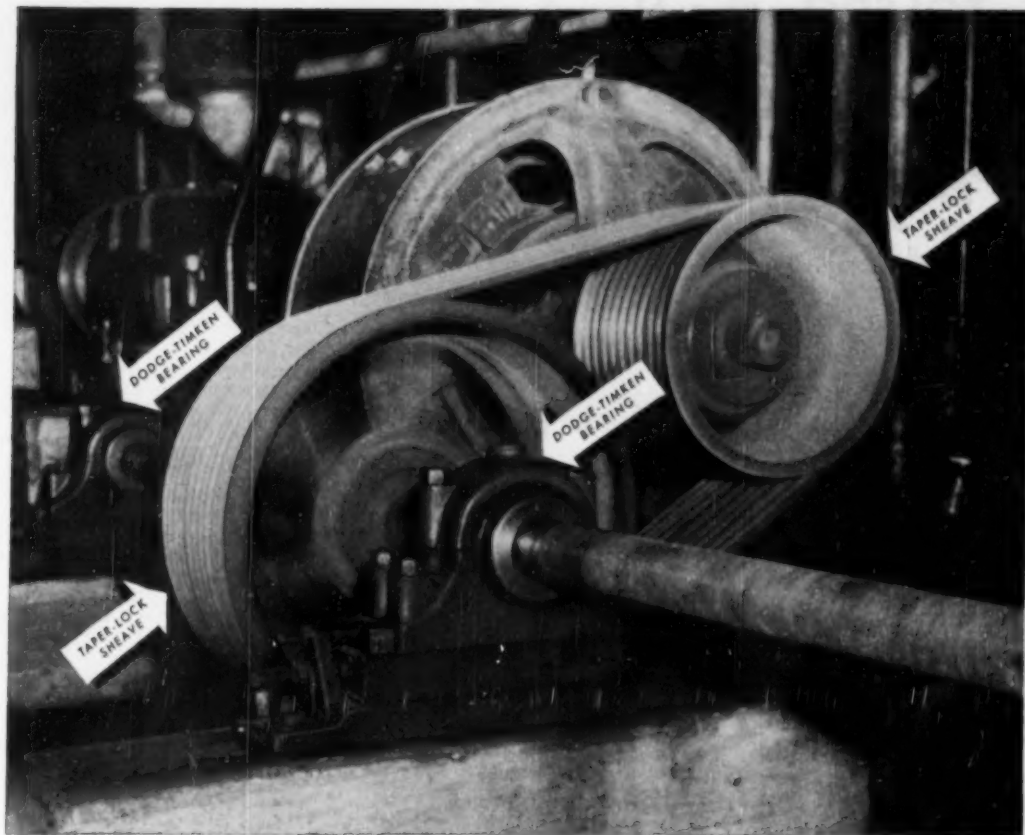
Sharp & Dohme, Inc., Philadelphia, has moved its New York branch office to larger quarters at 111 Eighth Ave.

Metal & Thermit Corp. has moved its general offices to 100 East 42nd St., New York.

United States Testing Co., Hoboken, N. J., has moved its New York offices to 330 West 42nd St.

Raybestos-Manhattan, Inc., Passaic, N. J., has moved its New York offices to 500 Fifth Ave. The company's department of marketing and merchandising has been moved to executive headquarters in Passaic.

Owens-Illinois Glass Co., Toledo, has moved its Dallas branch to 2201  
(Continued)



## DODGE-TIMKEN PILLOW BLOCKS

mounted, sealed, housed, fully assembled, ready to lock on the shaft and carry your power loads with new efficiency. Delivered from stock in four basic types and a vast range of sizes. Write for data.



**CALL A TRANSMISSIONER**  
He's factory-trained to help solve your power-drive problems. Look for his name under "Power Transmission Equipment" in your classified telephone directory.

## The Team That Cuts Production Costs on 100 Million Patterns

Fashion patterns, 100 million a year, are produced to sell at popular prices on the thoroughly modern equipment of the Simplicity Pattern Co. Dodge TAPER-LOCK V-Belt Drives, running on Dodge-Timken Bearings, enable Simplicity to save power, keep production rolling.

Equipment to produce at lower cost is your answer in today's competitive markets. Dodge "firsts" in power transmission machinery are helping in thousands of plants to modernize operations. . . . Get the facts about Dodge developments — Bearings, V-Belt Drives, Clutches and the new Torque-Arm Speed Reducer!

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of Mishawaka, Ind.

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ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS



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# TOLEDO

HEADQUARTERS FOR SCALES



### STOP ERRORS

Toledo Printweigh Scales provide printed weight records... assure you that the accurate indication of the Toledo dial will reach your accounting records without chance of human error.

### INDUSTRIAL NOTES, CONT.

Neils-Esperson Bldg., Houston, Tex. J. K. Dixon has been made sales engineer for the territory which will include the Gulf Coast east to Florida, Louisiana and Texas as far north as Waco.

Chemical Construction Corp. has moved to 488 Madison Ave., New York.

Builders-Providence, %Proportioners%, and Omega Machine Co. have moved to 345 Harris Ave., Providence, R. I. This places the administration, engineering, sales and service departments adjacent to the manufacturing department.

### NEW COMPANIES

Gas Machinery Co. (Canada), Ltd., Hamilton, Ontario, to provide Canadian industry with engineering, fabrication and erection of gas plant equipment.

Kromall Chemical and Dispersions Corp., Long Island City, N. Y., to manufacture dispersions which will come ready to be used in any color desired and need only to be mixed.

Atlas Powder Co., Canada, Ltd., Brantford, to manufacture and distribute Atlas industrial chemicals including sorbitol, mannitol, emulsifiers, detergents, wetting agents, dispersing agents and other types of surface active products. The organization is a joint venture of the Atlas Powder Co.'s industrial chemicals department and G. F. Sterne & Sons, Ltd., Brantford.

### NEW REPRESENTATIVES

Graver Water Conditioning Co., New York, has appointed the Bird-Archer Co. Ltd., Montreal, its Canadian representative.

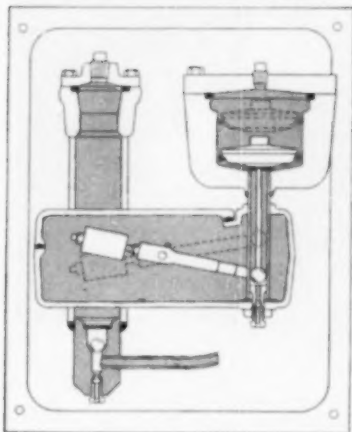
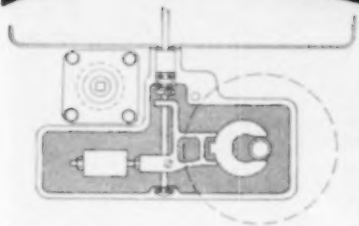
Pennsylvania Flexible Metallic Tubing Co., Philadelphia, has appointed the Boston Woven Hose and Rubber Co. of Pittsburgh its distributor in the Pittsburgh area.

Stoody Co. has appointed Morris, Wheeler & Co., Philadelphia, direct distributor for its hard facing alloys in eastern Pennsylvania, New Jersey, Maryland and Delaware.

Childers Mfg. Co., Houston, has appointed Metal Goods Corp. its exclusive distributor for aluminum weather-proof jacketing in the mid-west and southwest. End

**MORE ACCURATE . . . because it has MORE POWER and Less Friction**

## The HAYS-PENN MAGNA-CLUTCH MECHANICAL FLOW METER



### For COMPLETE SAFETY

No leakage possible of inflammable, explosive, or toxic fluids because of no pressure-tight bearings.

### For HIGHEST ACCURACY

Maximum Power, greatest mercury displacement because of largest float (3.75 in. diam.) and longest float travel (1.5 inches).

Minimum Friction, independent of working pressure because of elimination of pressure-tight bearing, internal knee bearing and shaft end-thrust bearing.

Highest ratio of power to friction.

Precise calibration check at 50 percent of differential available at extra cost.

### For LOWEST MAINTENANCE

Manometer accessible without disconnecting piping.

Only one internal moving part (the float).

No bearings to service.

Mercury volume not critical.

Manometer level not critical.

Mercury easily drained.

Positive mercury check valves.

### For UTMOST FLEXIBILITY

Field adjustable for any differential range:

35" tube from 17" to 35" water  
100" tube from 50" to 100" water  
200" tube from 100" to 200" water  
400" tube from 200" to 400" water  
750" tube from 400" to 750" water  
1500 or 2500 PSI working pressure

### For SPECIAL FEATURES

Any meter may be furnished with any or all of the following features:  
Dual (wide range) recording pen.  
Simple, accurate integrator.  
Temperature and/or pressure pens.

*Worth Reading*



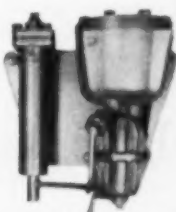
The Hays Corporation, Michigan City 9, Indiana



**HAYS-PENN**  
Electric  
FLOW METERS



1000 P.S.I.



2500 P.S.I.



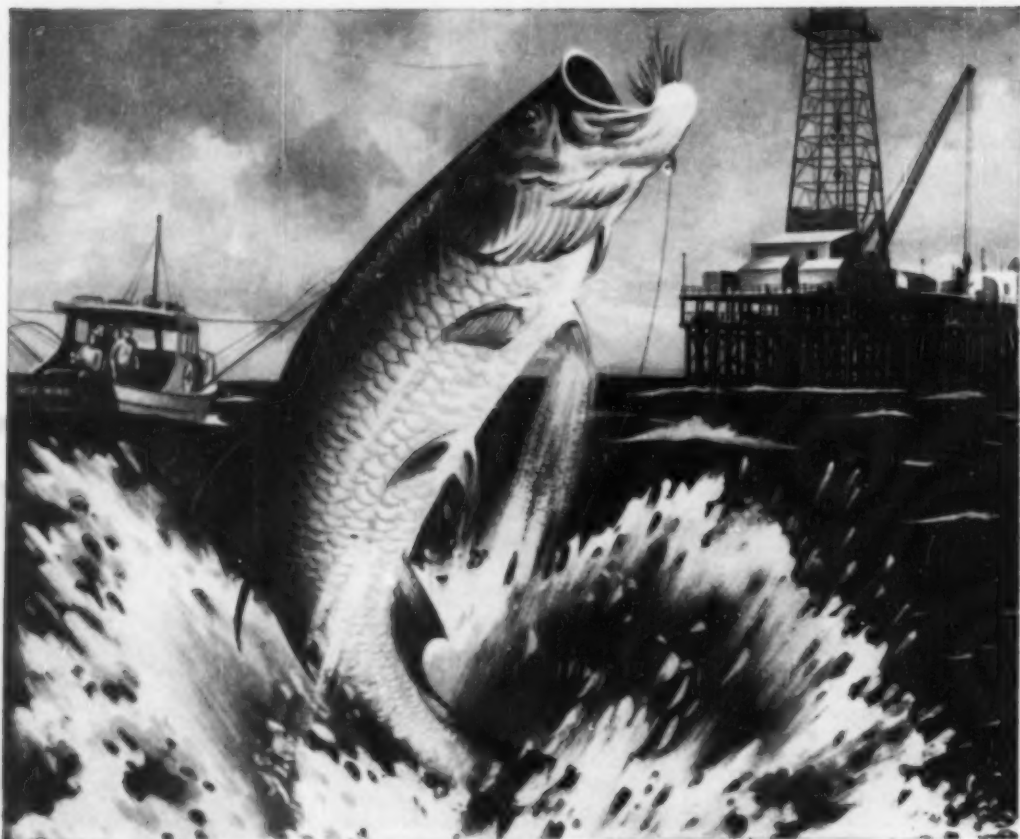
AREA METER 2" and 4"



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49-915**



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Brown & Root, Inc., has for over thirty years successfully engineered the widest variety of industrial construction projects. During this period, "Brown-Bilt" projects have achieved an enviable record for promptness and efficiency. Such punctuality is the result of forthright, earnest endeavor on the part of Brown & Root's entire staff of highly competent, loyal personnel.

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# Quotes, Extracts and Digests

MORGAN M. HOOVER, Assistant Editor

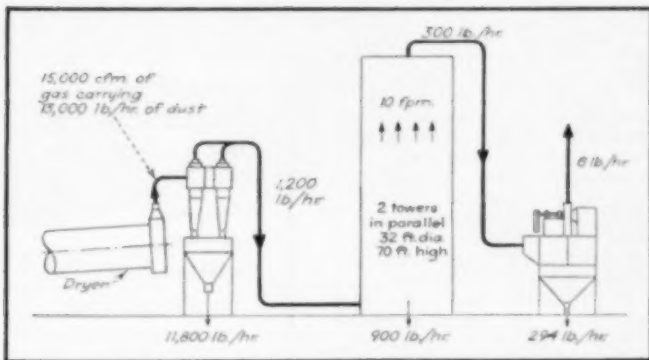


Fig. 1—Limestone dryer installation. Primary collectors remove 90 percent of the solids. Wet dust collector is also needed to satisfy public nuisance complaints.

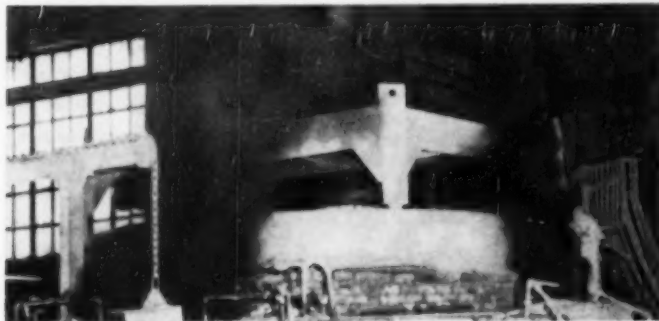


Fig. 2—Wet dust collectors can remove 80 percent of the dust particles coming off this electric melter, reducing stack concentration from 1.0 to 0.2 grains per cu. ft.

## Cleaning of Stack Gases From Calcining and Melting Operations

John M. Kane

The nationwide emphasis on air pollution and public nuisance control has focused attention on those applications where hot and often moist gases containing considerable quantities of solids are discharged to the atmosphere. As a group, such processes have not been provided with effective collection equipment because of the difficulty and expense involved.

Particle size of solids in stack gases is very small with high percentages of the material by weight in the low micron or sub-micron range. This is particularly true of solids in the stack gases from kilns, furnaces, roasters and like equipment where melting or chemical reactions like calcining take place. In rotating kilns or dryers, the stack gases flowing through the cas-

cading material air-convey high concentrations of fine solid particles from the process and up the discharge stacks.

When collection equipment is considered, the dry type centrifugal will seldom be selected except as a primary separator to remove the bulk of a heavy loading in a gas stream. Efficiency of these collectors is not good for low micron dust particles. The removal of flyash from pulverized fuel and spreader-type, stoker-fired boiler stack gases is an exception to this statement. Dry type centrifugal collectors for this problem have been accepted, except for plants of large volume emission rates like central stations located in builtup municipal areas.

Fabric type arresters will have little application to cleaning problems of the type under consideration as temperatures encountered are too high, or moisture content introduces condensation and plugging difficulties.

By the elimination process, the other basic types of equipment left for consideration are the high voltage electric precipitator and the wet type dust collector designs. While the electric precipitator gives excellent results on most applications in this group and has been used extensively where large gas volumes are involved, its high cost makes it unsuited to many smaller volume applications if less expensive equipment can give a reasonable degree of collection.

Wet collection methods have proved to be the answer to many of the stack gas cleaning problems in this group. Collection efficiency is high on particles in the small micron size; high temperature and moisture laden gases or both can be handled without difficulty. Shortcomings could be listed as corrosion where acid forming gases or materials are involved, and reduced collection efficiency on sub-micron particles encountered in metal fume collection and similar applications.

The collection required to satisfy public nuisance complaints from neighbors in a plant area can be illustrated by a typical limestone dryer problem, Fig. 1. Primary collection even with 90 percent removal will not alter discharge appearance or neighborhood complaints. The addition of the wet collector to remove practically

(Continued)



the economical  
practical solution  
to costly  
**WATER HAMMER**

With its renewable disc and seat, non-wearing conical spring, the Williams-Hager Valve offers dependable protection in any position—horizontal, vertical with flow upward, vertical with flow downward and angular. Easily installed or resealed without special tools. It is available in standard pipe sizes from 1" to 20".

Write for Bulletin WH 100

**THE WILLIAMS GAUGE CO.**

Pump Valves . . . Water Gauges . . . Gauge  
Cocks . . . Steam Traps . . . Pump Governors  
. . . Feed Water Regulators . . . Water Columns

2905 Pennsylvania Ave. • Pittsburgh (33), Pa.

**QED, cont. . .**

all of the solids proved the needed answer to such a problem.

An asphalt plant aggregate dryer presents a parallel problem. Dust loadings escaping the primary dry type centrifugal collector will range from 3 to 10 grains per cu. ft. Removal of 97 percent of these escaping fines can be obtained with wet collection equipment.

In the electric melting of steel, Fig. 2, over 90 percent of particles released are oxides of iron and silica with particle size in the order of 0.5 grains. Good conventional wet dust collectors can remove some 80 percent of such particles and reduce stack concentrations from about 1.0 grains per cu. ft. to concentrations in the order of 0.2 grains. Such a degree of cleaning will reduce but by no means eliminate visible discharge appearance.

When heated air is introduced into a coal pulverizing circuit to dry the coal going to the pulverizer, equal quantities of air must be vented from the closed circuit to the atmosphere. Dust loading on the discharge of a dry centrifugal collector ran better than 2.0 grains per cu. ft. of vented gas. Addition of good wet type dust collectors reduced quantities discharged to the atmosphere to less than 0.14 grains with drastic improvements in the discharge appearance.

With some of the more recent introductions in wet collector design, further reduction in solids escapement is possible from operations like the electric melting furnace for steel, the zinc oxides from brass furnaces, and the lead oxides from battery smelting. Improved collection will normally involve drastic increase in equipment, power, and water costs.

John M. Kane, American Air Filter Co., before the American Society of Mechanical Engineers, Pittsburgh, April 24, 1950.

**STEEL**

**. . . Iron Ore Supplies**

Benjamin F. Fairless

It is fortunate for the country and for the many smaller steel companies that there are larger companies in the steel industry which are willing and capable of taking the necessary steps to assure an adequate iron ore supply for this country.

An adequate supply of iron ore in this country is primarily a production and cost problem. It is not a question of exhaustion of the ore reserves in the United States.

With the progressive depletion of  
(Continued)



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standardization  
on your 125 lb.  
bronze valve  
requirements**

*I*N THIS LINE OF VALVES you'll find just what you need to take care of your requirements for 125 lb. service. And you'll also get the inherent values that go into the design and manufacture of every Lunkenheim product . . . the finest of materials, metallurgically tested and approved; sound engineering design; perfect alignment of parts; meticulous accuracy; craftsmanship guaranteed by skill and ripe experience; the most modern equipment to produce better, and ever better products.

It is the balanced combination of all these factors that has made Lunkenheim the synonym of highest valve quality, and your guarantee of lowest valve cost per dollar invested.

Give any Lunkenheim valve a chance to prove itself in service. Once installed, it will quickly demonstrate real economy. Its performance, under all conditions, will be a firm recommendation for your complete standardization on Lunkenheim . . . and the solution of your valve problems.

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is stocking these 125 lb. S. P. Bronze Valves. Call upon him for your original equipment, replacement and repair valve requirements.

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NEW YORK 13 - CHICAGO 6 - BOSTON 10 - PHILADELPHIA 24  
EXPORT DEPT. CINCINNATI 14, OHIO, U.S.A.



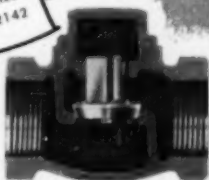
Gate  
Fig. 2125  
Double Wedge Disc  
Fig. 2127  
Solid Wedge Disc  
Fig. 2129  
Single Wedge Disc



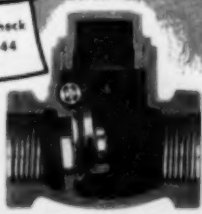
Globe  
Fig. 2140



Angle  
Fig. 2141



Lift Check  
Fig. 2142



Swing Check  
Fig. 2144

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to Handle Almost  
Any Volume or  
Any Type of Liquid:



From  $\frac{1}{30}$  to  
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per minute can  
be metered by  
NIAGARA Meters.  
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 $\frac{1}{2}$ " to 6" diameter.

For Oils,  
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and Other  
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## BUFFALO METER CO.

2893 MAIN STREET  
BUFFALO, N. Y.

QED, cont. . .

the deposits of high grade iron ore, it is gradually becoming more and more necessary to utilize lower grade domestic ore deposits. United States Steel and others already have worked out methods for doing this and are far along with the plans necessary to accomplish this result.

At the same time, United States Steel, as well as others, have thought it advisable to find and develop new sources of high grade iron ore outside of the United States. Large foreign deposits of high grade ore already have been found and are now under development. In other words, the American steel industry faces for the future a production and cost problem, and not one of scarcity of iron ore.

Frankly, I cannot become too excited by the fact that certain people are only now discovering the problem which individual companies in the iron ore industry recognized years ago. How can I be, when the solution for the problem already has been found? To me, it illustrates again why our economy is better off when industry does its own forward planning and solves its own problems, instead of relying upon government to do its thinking and planning for it.

Benjamin F. Fairless, U.S. Steel Corp., before the Celler Committee hearings, Washington, April 27, 1950.

## RUBBER PROCESSING

. . . Carbon Black—  
New Concept

R. S. Stearns and B. L. Johnson

An entirely new concept of the role of carbon black in rubber processing explains the toughening effect of carbon black on rubber in chemical rather than physical terms, and thus upsets the view which has prevailed among rubber technologists for many years.

Submicroscopic particles of carbon black which are added to rubber in the manufacture of tires and many (Continued)

## CORRECTION, PLEASE!

"Recent discussion may have confused those not familiar with the facts into believing that this nation is short of iron ore. What is taking place today does not involve a present ore shortage, but rather is a re-evaluation of various future sources of supply."

JOHN G. MUNSON, Vice President  
U. S. Steel Corp. of Delaware

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QED, cont. . .

other rubber products are not tiny, inert particles of carbon, as they have long been pictured, but should be considered as large molecules with reactive carbon atoms on their surfaces similar to the reactive carbon atoms of rubber.

Existence of these active groups enables the carbon black to take part in the vulcanization reaction, and to combine chemically with the rubber, becoming in actuality a part of the rubber itself.

Carbon black, a soot-like material, was first added to rubber by Charles Goodyear about 1855, mostly to serve as a filler and to decrease the cost of the final product. It was soon realized, however, that the carbon black played a more important role than that of a dilutant, for it was observed that when carbon black was present many of the physical properties of the rubber were enhanced.

It has since been used to increase the life expectancy of automobile tires to more than 30,000 mi. and has improved the strength, durability, and bounce of rubber products in thousands of other applications. Up to now, it has not been possible to explain how an inert material like carbon black could accomplish this gratifying transformation.

The results of the research demonstrated the presence of active groups on the surface of carbon black particles, making it possible for these particles to become bound to the rubber through carbon-sulphur bonds in the same manner in which the sulphur reacts with rubber to bring about the familiar improvement in properties which accompanies vulcanization.

It is in the ability of the carbon black to react chemically with the polymer during vulcanization that the answer to the mechanism of reinforcement lies.

It is now possible, in addition to controlling the surface area and size of carbon black particles, to control the chemical nature of the surface. Thus, certain blacks are indicated to

(Continued)

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QED, cont. . .

have, in addition to the physical adsorptive forces, greater degrees of chemical activity which enhance the value of rubber products in which they are contained.

R. S. Stearns and R. L. Johnson, Firestone Tire and Rubber Co., before Division of Rubber Chemistry, American Chemical Society, Detroit, April 21, 1950.

## REFRACTORY CERMETS

. . . as Cathodes

L. J. Cronin

An investigation of cermets for vacuum tube applications has resulted in a molybdenum-ThO<sub>2</sub> body for use as cathodes in Magnetron tubes. Materials with melting points as low as 1,800 deg. C. were considered since the usual operating temperature for these parts is between 1,000 and 1,700 deg. C. In addition to refractoriness, low vapor pressure, chemical stability, adequate thermionic and secondary electron emission, and hot strength are required of any materials selected for this application.

A great many materials with melting points over 1,800 deg. C. were used but found unsatisfactory primarily because of instability. After thorium and molybdenum had been selected, further studies were made to see if the thorium content could be reduced by diluting with another oxide. This was unsuccessful due to the low fusion temperature of the eutectics formed.

Great care is taken in the testing and controlling of the powdered raw materials. The cathodes are pressed in the form of thin walled cylinders in a steel die at pressures between 5,000 and 200,000 psi. depending upon the properties desired. After pressing, they are degreased by dipping in carbon tetrachloride, and fired in a hydrogen atmosphere at 1,500 to 2,200 deg. C. The firing time can range from five minutes to several

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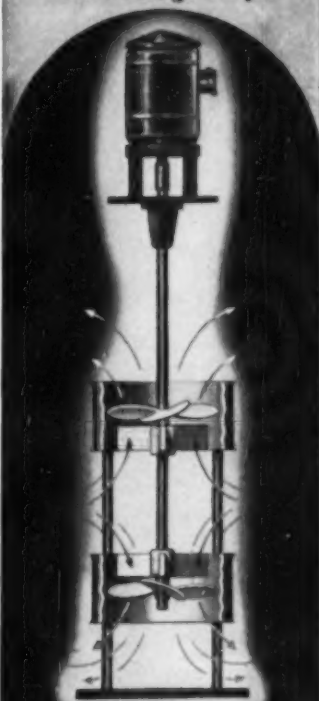
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QED, cont. . .

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L. J. Cronin, Raytheon Mfg. Co., before the American Ceramic Society, New York, April 22, 1949.

## FOREIGN MANUFACTURE

### . . . Advantages and Disadvantages

John L. Gillis

American firms should take on the complicated problems of establishing foreign manufacture only when the motives for doing so are so compelling as to be almost overpowering. If it were equally easy to build business outside the United States by selling from American production, the question of foreign manufacture would never come up.

Here are some briefly stated arguments against leaving the comparatively comfortable economic atmosphere of the United States for the establishment of manufacture in other countries:

In entering another country one must become subject to its laws and taxes, which are different from those to which one is accustomed at home.

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(Continued)

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T. J. BARRY, Consultant  
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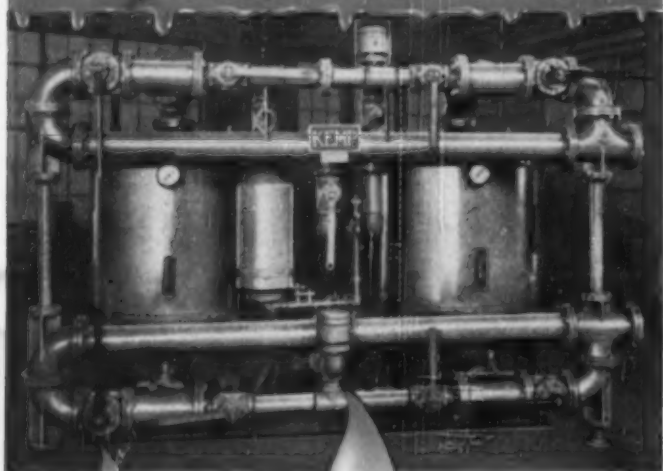
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QED, cont. . .

unfamiliar with the business, and particularly with the policies of the home management. If a representative of the parent company is sent, he has the disadvantage of a lack of knowledge of local laws, customs and practices.

We are fond of complaining of government intervention and interference with business in the United States. We are still probably better off in that regard than any other country in the world.

The danger of total or major loss in case of war or revolution is becoming more of a factor.

Foreign operation will replace a good part of the export market for the products to be manufactured. This is a point which is frequently raised by labor unions in this country.

Now let's turn to some of the attractions of foreign manufacture:

There is the immediate advantage of passing through the barriers of tariffs, exchange controls, quotas and other artificial impediments to business.

A very real advantage in establishing local manufacture is the improvement in development of the market in which the factory is located.

Local production can be tailored to local demand and preference.

Local operation by contributing additional employment and purchasing power is of very real benefit to the country where established.

An American firm establishing manufacture in another country frequently combines with local capital. This is constructive in the creation of good feeling between countries.

John L. Gillis, Monsanto Chemical Co., before the Commercial Chemical Development Association, New York, N. Y., Mar. 22, 1950.

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### . . . Sans Stop Watch

Haylett B. Shaw

The procedure known as methods-time measurement has been developed and thoroughly tested by application in 28 different factories. The procedure makes use of predetermined time standards for all motions employed to accomplish work. These were developed during several years of intensive research.

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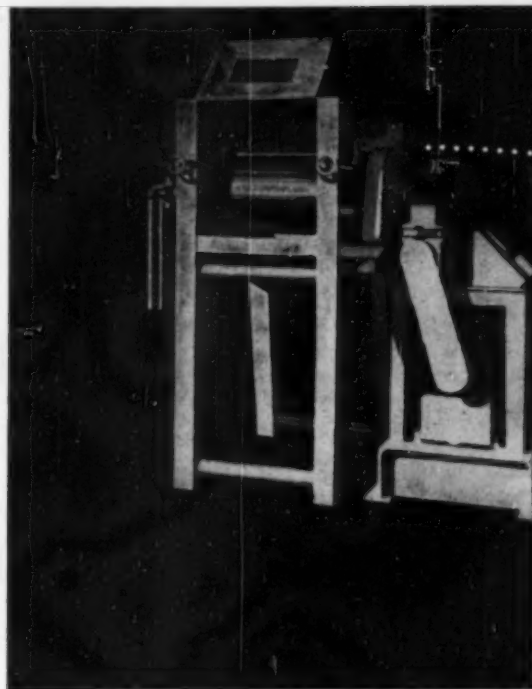


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QED, cont. . .

work to obtain an accurate time standard. Accurate estimating is often important when new products are being considered.

Haylett B. Shaw, Methods Engineering Council, before the American Society of Mechanical Engineers and the Pittsburgh Mechanical Engineering Conference, Pittsburgh, April 25, 1950.

## FREE ENTERPRISE

. . . Its Defense

Charles A. Cary

The first step toward defending free enterprise is to let in the light of truth—to challenge the outrageous allegations that have been accepted by a credulous public, not with more wild words, but with facts, patiently and consistently demonstrated, and nailed down by solid, thoroughly prepared argument.

If you were to ask the average man how much profit a large and successful business makes, what do you think he would guess? Polls have been taken on the subject, and the answers are astounding. The majority of guesses run from 25 to 50 percent profit and more. If a man thinks companies make profits like that, why wouldn't he think it was too much? But would he think it was too much if he knew the truth? We know the answer to that, too, because the pollsters have asked that question. The man in the street figures 10 percent profit would be fair. And 10 percent profit is double the profit of the average American company. Du Pont's return on the investment used in its business in 1948, the most recent year for which figures are available, was 9.3 percent. The U. S. Department of Commerce officials statistics reveal that for the first nine months of 1949 the profits of all American corporations were only 4.7 c. of each sales dollar. That's something you can sell in this battle for men's minds.

Here's another. The idea is being sold by unsupported assertions that the big companies are taking over the small ones so fast that pretty soon there won't be anything but a few big businesses. Let's look at that one a minute. The government figures that a business employing 1,000 or more people, is a big business and reports that there are in the United States 975 companies in that category. But that is only 975 out of four million. That's right. Four million companies in the United States, and only one in over four thousand is what the government calls big business. That doesn't look as if the big boys had got very far with their swallowing.

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GEAR and PUMP CO., Inc.

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As a matter of fact—and this is the heart of the matter—they've got further to go on now than they ever had before. They aren't even gaining in the race. The little fellows have been growing at a terrific rate . . . the number of businesses in the United States was only a million and a half in 1900. The truth is that both small and big business have been growing at much the same rate, because they are partners and each other's best customers.

Charles A. Cary, E. I. du Pont de Nemours & Co., before the Traffic Club, Wilmington, Del., Mar. 8, 1955.

## SUPERVISORS

. . . Their Selection

H. J. Voorhis

When supervisory vacancies occur, the policy has been to select supervisors from among present employees. Rarely is a person employed from outside the company to fill directly a supervisory job. Several years ago the refinery embarked on an organized, formal program to develop the best possible methods of selecting new supervisors. With the assistance of a firm of personnel consultants, personnel research was conducted to determine the characteristics and traits of good supervisors, and to devise some method of recognizing and measuring these characteristics in men being considered for supervisory jobs. Carefully selected groups of definitely above-average, definitely below-average, and average supervisors formed the criteria by which these characteristics and traits could be discovered and measured. Only individuals on whom complete agreement was obtained from several performance raters were included in the criterion groups.

All supervisors in the refinery participated voluntarily in the research, and filled out a number of questionnaires and forms concerning their personal background, preferences, opinions, likes and dislikes, and similar. In addition to answering these forms, each supervisor took a number of written tests of the conventional type. By analyzing the mass of data accumulated on each of the carefully selected criterion groups, several forms and tests were developed which are proving to be reliable aids in selecting new supervisors.

New supervisors are now being selected from among those employees who have taken the selection tests. The employee with the highest score may not necessarily be selected, but

(Continued)

## JERGUSON Explosion-Proof GAGE ILLUMINATORS



Give Even,  
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Low Cost Lighting  
Greater Safety  
Of Operation  
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Gage Reading

**J**ERGUSON Explosion-Proof Gage Illuminators give you the best, lowest cost, most efficient gage lighting.

Utilizing the principle of solid wedge lighting, Jerguson Illuminators give clear, even lighting, without bright spots. Light flows through the plastic wedge and is reflected evenly through the back of the gage glass to give quick, easy, accurate reading. You get better illumination at lower cost because only one small lamp is required. Savings in electricity soon pay for the illuminator.

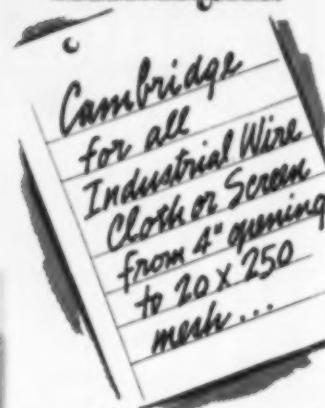
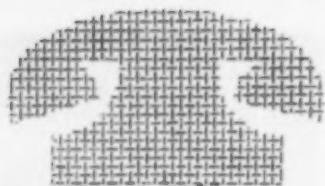
Jerguson Illuminators have aluminum explosion-proof housing for the wiring and heat resisting glass explosion-proof housing for the lamp. You get maximum safety, more efficient lighting with Jerguson. Made for all sizes of transparent gages. It will pay you to investigate.

Illustration shows single and double Jerguson Illuminators on a 3-section gage. Write today for full information. Ask also for Data Units on Jerguson Gages and Valves to fit your needs.

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**QED, cont.**

the scores are considered along with other information. An attempt is made to anticipate vacancies in supervisory ranks before they occur, and the tests are given to a relatively large number of prospective supervisors.

H. J. Voorhies, Esso Standard Oil Co., before the American Petroleum Institute, Cleveland, May 2, 1950.

## STEEL

*... Slag and Pickle Liquor Get Together*

S. S. Heide

One of the steel industry's most troublesome waste-disposal problems has been solved by a method which at the same time effects a production economy and creates a marketable new product.

Pouring molten blast furnace slag into the waste pickle liquor evaporates the water from the liquor, neutralizes its acidity, granulates the slag, and produces a porous product which can be dried, crushed, and used to reduce the acidity of raw commercial fertilizer mixtures and prevent caking.

Extensive tests conducted at a southern fertilizer works definitely established that the use of this blast furnace slag as a filler and conditioner obviates the need for the usual conditioners, and limestone and dolomite neutralizing materials. The slag product also adds substantial amounts of iron, manganese, and in some cases potash.

Neutralization of pickle liquor with lime is impractical due to the bulky, slimy nature of the products formed, and the recovery of the sulphuric acid is not feasible.

For many years blast furnace slag has been granulated by pouring it in a molten condition on the surface of water. The large amounts of water evaporated suggested that waste pickle liquor might be completely evaporated by the heat of the molten slag.

In the new process the waste pickle liquor is emptied into a pit of several thousand gallons capacity adjacent to the railroad track. Molten blast furnace slag is brought directly from the furnace in a regular slag pot or a ladle, and poured onto the surface of the liquor. To facilitate granulation of the slag, steel plates are placed at the side of the pit to deflect the molten slag over the surface of the liquor.

S. S. Heide, Tennessee Coal, Iron, and Railroad Co., before Division of Water, Sewage and Sanitation Chemistry, American Chemical Society, Detroit, April 19, 1950.

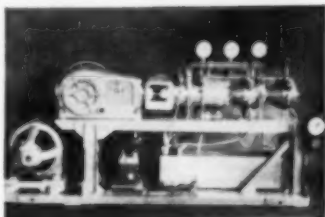
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A four-stage compressor designed for pilot plants and laboratories where pressures up to 6000 pounds are required in volume from two to three cfm. Smaller sizes available. Cylinders are constructed of steel, and can be made of any corrosion resisting material specified. The base, an integral part of the machine, can be equipped with wheels.



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Two of several wool bins in the Hardwick and Magee Spinning Mill—built with K&M APAC.

## ON GUARD: K&M "Century" APAC

When raw wool or processed wool is stored in bulk, there's danger of fire—not only from external causes, but also from spontaneous combustion. That's one of the reasons the Hardwick and Magee Company, nationally known carpet and rug manufacturers, chose K&M APAC for the construction of these wool bins in their modern spinning mill.

K&M APAC—specially processed sheets of asbestos-cement—resists fire effectively and dependably. The smooth, hard finish of APAC prevents fibrous matter and dust from adhering to the surface—reduces materially the opportunity for fire to spread. And K&M APAC stops the other enemies of raw materials, also—weather, rust, rot, termites, and rodents can't affect it.

You'll like the installation economies you get from using K&M APAC, too. Sheet sections are large (4' x 8') and strong, but not bulky; they handle easily, can be cut and fitted on the job, are quickly

erected. And you save on maintenance costs, too, for K&M APAC doesn't need even paint to preserve its attractive finish.

It will pay you to consider K&M APAC Asbestos-Cement Sheets for such needs as panels, partitions, sheathing, shaft casings, bins, in fact, for all flat surfaces both interior and exterior. APAC can be applied over insulation boards, wood studs, solid wood sheathing, steel or wood girts. It's adaptable and economical—the perfect answer to flat surface covering problems.

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Are you merely removing unwanted solids in your product, or, as with this pharmaceutical manufacturer, are you filtering to obtain unusually high purity? Whatever the degree of filtration required, you can obtain *purer, cleaner, clearer* filtrates with Celite\*, for these reasons:

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If you are having difficulty in getting the desired purity or clarity in your product, it may be because you're not using the correct filter aid. Tell us your problem. Our broad experience in solving all types of industrial filtration problems is at your service. Address Johns-Manville, Box 290, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

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### FILTER AIDS AND FILLERS

# Chemical Engineer's Bookshelf

LESTER B. POPE, Associate Editor

## How to Revise an Electrochemical Reference

**INDUSTRIAL ELECTROCHEMISTRY.** Third edition. By Charles L. Mantell. McGraw-Hill Book Co., New York. 781 pages. \$8.50.

You're an author. Well, even if you're not, let's pretend you are. As an authority on commercial electrochemistry, you could be. So let's make believe that you have just received the first copies of your new book which you titled "Electrochemical Engineering." After years of work you handed the manuscript to the publisher. You read proofs. You waited. Here it is in its pristine loveliness. You quickly thumb through it. Probably a little inaudible profanity expresses the relief you feel when you see that your name is spelled right, that the pages are all there, that there are no parts missing.

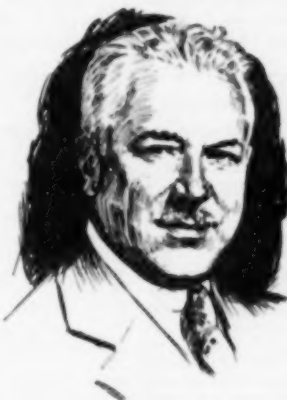
What's next? Well, some day you will have to (or you will want to) get out a new edition. Now is the time to start. From here on I will tell you the steps, what to do, how to get a new edition of "Electrochemical Engineering" ready for the publisher.

First, you put your new book on the table behind your desk. It's within easy reach. Henceforth it is the "hell book." (So called because you raise hell if it disappears or if anyone borrows it.) In the hell book you are to write marginal notes—all the corrections, carpings, caustic comment and constructive criticism that will come by phone, that will be brought by the mail man, that will appear in person. Take them all. They all go into the hell book.

Something else will come, too. Work. People all over the world need help when they want to build a caustic plant, to make calcium glutamate, to produce copper, or to do anything electrochemical. They will pay you.

This enables you to keep up the payments on your house in Manhasset and to rent an office in lower Manhattan. It will also allow you to contract with the Long Island Rail Road to get you from one to the other, and vice versa. It puts your two kids through school. It buys golf balls and fishing tackle.

This work, in other words, supports you and your family while you gather material for your new edition. This



C. L. Mantell

He has a new hell book.

work, too, becomes part of the new edition. Your 75,000-kw. job in the Andes of Argentina and the other consulting jobs here and abroad are raw material to be concentrated and refined into the revised edition. In effect your first edition is advertising. From it you get publicity, jobs, work, experience, material for revising, and also the satisfaction of textbook assistance to thousands of undergraduate engineers.

After about ten years the hell book will have a lot of stuff in it. You can start the real process of revision. You can work on Chapter I which covers the scope of the electrochemical industries. Expand it. Bring it up to date. Rewrite parts of the theoretical section.

You can add new methods (polarography and amperometric titration) in the section on electrochemical analysis. The war and its outcome released a lot of German know-how on hydrogen peroxide, cuprous oxide, mercuric oxide and manganese dioxide. Add it.

Corrosion is an electrochemical phenomenon. Progress has been made that will mean new paragraphs in your corrosion chapter. Emphasize cathodic protection of pipelines, structures and the like.

There are new data on colloids—bitumen and resin deposition. Don't forget new secondary cells, war-devel-

oped primary cells, selenium rectifiers. Get all these in.

Of course electroplating is a big part of your book. Bring it up to date, too. Put some emphasis on electrolytic polishing, electrolytic tin plate, alloy plating, metal powders.

In refining, you will cooperate with all the companies in the world. They furnish operating data; you correlate and tabulate. Electrowinning, too, gets this sort of cooperation so you can modernize that chapter. Expand the sections on antimony, cobalt, chromium and manganese. There's a new rotating cathode cell for cadmium.

Change your section on "Electrolysis of Alkali Halides" by adding "and Sulfates" so you can include sodium sulphate. Give increased attention to vertical mercury cells and electrolysis of potassium salts, of fluorides and fluorine production. There are new data on hydrogen and oxygen cells to be added, the Trail cell, for example.

Fused salt electrolysis is where you must add information on columbium and zirconium; expand sodium; enlarge lithium. Drop a few from the electric furnaces chapter and add the new ones. In the electrochemistry of gases chapter add hydrogen peroxide by electric discharge. Materials of construction are important so revise that chapter and incorporate new materials.

Finish off the whole with emphasis on engineering and electrical aspects of power generation and economics. And when you're all done write a nice preface giving thanks to the many people that helped you.

All this tells how to revise a book. If you've written one on industrial electrochemistry, just follow the directions given above and you'll have a revised edition. As soon as it comes out reviewers will look for things that are wrong. They prove their own qualifications by pointing out the things you forgot. For example, they will say that you should have included something on load-center power distribution and on mechanical rectification. Also you could have added new material on electronic tubes. Pay no attention to these pedants. The book will sell. Start another hell book and in another ten years you can amend and revise it again.

On second thought, you'd better pick some other subject. Dr. Mantell  
(Continued)

has already followed the procedure described here. He beat you to it. His revised "Industrial Electrochemistry" was published April 26th.—LBP

#### Science and Common Sense

**PHENOMENA, ATOMS AND MOLECULES.** By Irving Langmuir. Philosophical Library, New York. 436 pages. \$10.

Reviewed by H. C. Parmelee

Twenty papers, roughly 10 percent of the author's voluminous contributions to scientific literature, have been brought together in this volume. They were published originally in current literature over the period 1914-1945, and represent "an attempt to interpret phenomena in terms of mechanism or atomic and molecular interactions." For the most part they deal with the structure of matter, chemical reactions at high temperatures and low pressures, and surface chemistry—adsorption, surface tension, and monomolecular films. It was for the author's brilliant research in the field of surface chemistry that he was awarded the Nobel chemistry prize in 1932, and a chapter of the book contains his lecture in Stockholm on that occasion. Another chapter presents his

address on atomic hydrogen as an aid to industrial research, when he received the Perkin medal in 1928.

Unlike many scientists, who achieve preeminence in one field, Langmuir ranges over a wide variety of interests, as his more than 200 papers testify. And, still more unusual, he adds to profound scientific knowledge a sensible grasp of social problems to which many scientists are indifferent. So, if the reader finds it difficult to become deeply absorbed in the chapter on "Metastable Atoms and Electrons Produced by Resonance Radiation in Neon," he can still find mental stimu-

lus in the thoughts expressed in "Science, Common Sense, and Decency," presented as retiring president of the AAAS. He will also be favorably impressed by the author's sound ideas on "Science Legislation," offered at Senate hearings, and by his comments on the philosophy and technique of industrial research contained in his Perkin medal address.

#### Add Chickens & Snow

**RADIANT HEATING.** Second edition. By T. Napier Adam. The Industrial Press, New York. 504 pages. \$6.

Reviewed by James A. Massaro

The first edition, published in 1947, has been expanded and revised to include the latest developments in the field of radiant heating and cooling. As was the case in the first edition, also reviewed by this writer, sufficient theory is included to establish the foundation necessary for the proper presentation of the subject matter. Once again, however, the theory is minimized in favor of the practical application of radiant heating and cooling systems to actual problems in residential, commercial, industrial, and institutional building.

In expanding, the second edition has added some 32 pages of text and

(Continued)

#### RECENT BOOKS RECEIVED

**The Autobiography of Robert A. Millikan.** Prentice-Hall. \$4.50.

**Biological Studies With Polonium, Radium and Plutonium.** By R. M. Fink. McGraw-Hill. \$3.75.

**Chemical Inventions and Chemical Patents.** By Edward Thomas. Matthew Bender & Co. \$16.50.

**General Chemistry.** 2nd edition. By J. A. Timpa. McGraw-Hill. \$4.50.

**Heterocyclic Compounds, Vol. 1.** By R. C. Elderfield. Wiley. \$11.

**Phenolic Resins.** By P. Robitschek & A. Lewin. Riffe (London). \$6.75.

**Refining of Non-Ferrous Metals.** Institution of Mining and Metallurgy (London) 40s.

**Sales Engineering.** 2nd edition. By B. Lester. Wiley. \$3.

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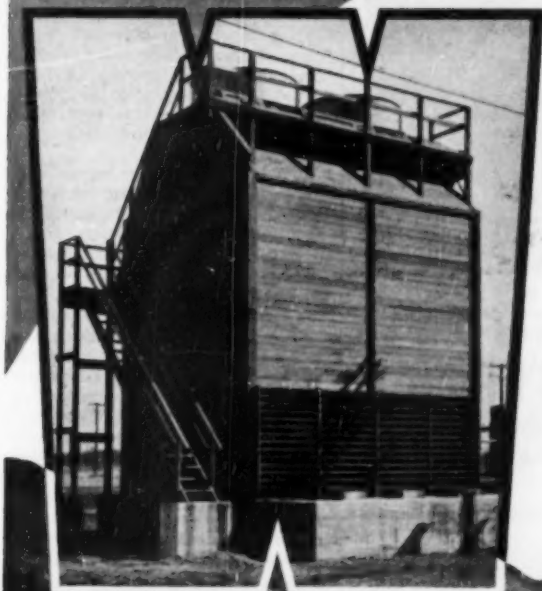
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# WATER'S TOO SCARCE and COSTLY to WASTE

## Save it with a C. H. W. Cooling Tower



Look how much this source of water has dried up! And this is no exception, either. More and more plants are feeling the "pinch" in water supply. Industrial expansion, plus higher domestic use, has overtaxed supply in many areas. Good surface water sources are low and, in areas where there is plenty, the quality is poor and costly to make usable. Although sufficient underground water deposits exist,\* it will be several years before they can be tapped. All this means that you'll have to get the most out of what you have, or face production cuts or even a shutdown. But there is something you can do—use a C. H. W. cooling tower for operations requiring cooled water, thus permitting use of the same water over and over again. And you'll find that a C. H. W. cooling tower will not only save water and its cost, but also that cooling performance is guaranteed. For any operation requiring cooled water—chemical, processing, petroleum, air conditioning, etc.—check on a C. H. W. cooling tower first. Write for literature.

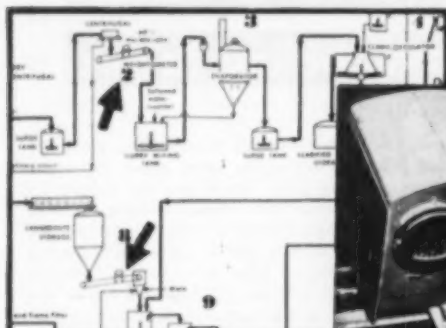
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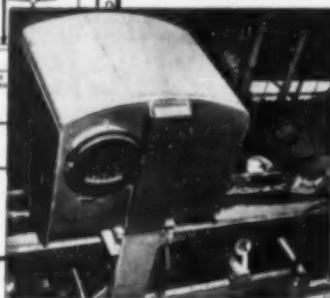
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From Chemical Engineering  
January 1959



International Mineral and Chemical Corporation weighs and controls the weight of KCl and K<sub>2</sub>SO<sub>4</sub> with the aid of the WEIGHTOMETER.

## WEIGHTOMETER®

This unit also controls and proportions the liquid.

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BOOKSHELF, cont. . .

14 additional charts making a total of 78 charts readily accessible in the final chapter for the easy and direct determination of the pipe size and spacing necessary, covering iron and steel pipe in addition to copper tubing, in various ceiling, wall, and floor covering panel combinations.

Chapter 7, on radiant heating with ceiling panels, was expanded to include illustrated discussion of enclosed convector panels, gravity warm air panels, and forced warm air panels, all newer developments now being employed since the first edition was published.

Chapter 8, on radiant heating with floor panels, presents an interesting discussion on the physiological effects of heating floors on human beings and animals. Data are added on the use of floor panels in chicken brooder houses.

Chapter 9, on walls, baseboard, electrical, and metal panels, has been increased to cover newer developments, such as: electrically conductive rubber coated panels, portable electrically-heated screens to provide local sources of heat, combination units for lighting and local heating, radiant glass panels which are used not only in aircraft windows but also in rooms with large glass wall or ceiling areas, and baseboard heating to overcome deficiencies of available panel surface and to counteract down drafts from windows.

Due to the increased use of radiant heating in snow melting installations, the chapter on snow melting has been increased in size to cover practical information for those who plan to design such systems.

All in all, the second edition is an exceedingly practical book, devoid of extensive mathematics, but including all of the pertinent data and charts to simplify the step by step procedure in the design of radiant heating and cooling panels.

The engineer and the contractor, as well as the student, will find the information in this volume easy to understand, and the design procedure easy to follow. The author cannot be commended too highly for his very creditable accomplishment in this regard.

### Smith, to Kendall, to Ehret

SMITH'S INTRODUCTORY COLLEGE CHEMISTRY. Third edition. By William F. Ehret. Published by Appleton-Century-Crofts, New York. 511 pages. \$4.25.

Following the familiar form of James Kendall's first two editions of

this well-known book, Professor William F. Ehret of New York University has accomplished a thorough revision to bring it up to date.

The book is distinctively attractive in its 7½ x 10-in. size, and is quite readable. Additional illustrations have been introduced, but there is still room for more. Liberal use of equations is very good. In our opinion, this edition will be useful not only as an introductory textbook, "but also to those who just wish to know the fundamentals of a science and how the scientist works and reasons."—CWM

#### Tensile Strength of Water

DEFORMATION AND FLOW. By Marcus Reiner. Lewis & Co., London. Interscience Publishers, New York. 346 pages. \$6.50.

Reviewed by George E. Alves

Several books on rheology have appeared recently; however, this book by a noted authority offers an excellent introduction to theoretical rheology. In the preface the author states that there was no attempt to cover the whole field of rheology, but that a broad view was taken of the field.

The book is divided into 20 chapters. A discussion is given of the three ideal bodies, namely, Hooke solid, St. Venant solid, and Newtonian liquid. Work of Hagen and Poiseuille, equations for the flow of Bingham plastics through circular tubes and analogous equations for the behavior in rotational viscometers, and a discussion of structural viscosity are also presented.

A very interesting treatment is given of power laws to relate the rate of shear to the shear stress for "general" bodies. The author proposes the term "generalized Newtonian liquid" in place of his previous term "non-Newtonian liquid," which in this country is called "pseudo-plastic material." Much confusion exists over nomenclature; however, the Joint Committee on Rheology is engaged in preparing recommendations for a standard nomenclature (see Proceedings of the International Congress on Rheology 1948).

The discussion of wall effects is very good. Rheological relationships including slippage along the wall are derived for both the capillary tube and the rotating cylinder.

Reynold's experiments on dilatancy are described and the discussion of the Weissenberg effect is interesting. However, descriptions of rheopexy and thixotropy were omitted.

A chapter is devoted to strength, including the tensile strength of water. An enlightening discussion is also

(Continued)

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### with the New McKee Horizontal DOWTHERM VAPORIZER

It is only in the past year that this Horizontal Dowtherm Vaporizer has been put on the market. However, the original unit was designed and put in typical plant service back in 1937, and has been in almost constant operation since that time, at temperatures ranging up to 700 deg. F.

In the meantime new designs have been developed and constant improvements made, so that in the new McKee Horizontal Dowtherm Vaporizer you get a combination of installation-proven performance and the very latest engineering advancements.

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Where ample floor space is available this new Horizontal model is recommended because of these specific advantages: Low Liquid Level, which facilitates gravity return of condensate; Combustion Economy, resulting from having all heating surfaces below liquid level; Elimination of Heat Loss through furnace wall, as combustion is within the vaporizer; and Absence of Flat Surface with heat on other side, on which deposit could form and build up.

Available in sizes from 300,000 BTU up through 3,500,000 BTU, for temperatures up to 650 deg. F. Also in vertical models for use where floor space is at a premium. Write for Bulletin of type in which you are interested.



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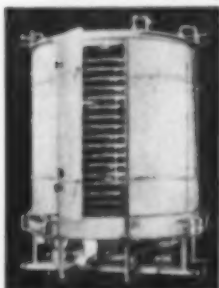
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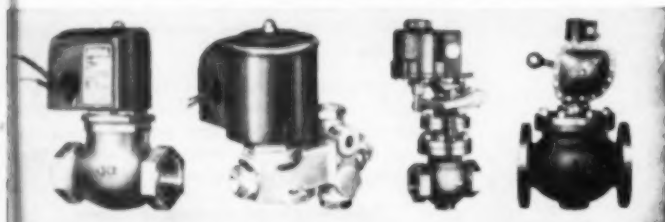
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BOOKSHELF, cont. . .

given of structural turbulence and the relation between the critical velocity for structural turbulence and the Reynolds critical velocity.

Work hardening and topics such as bulk modulus, Young's modulus, and limiting relative volume due to infinite pressure are discussed in several chapters. The usual relationships for bending and torsion are included. A fascinating discussion of the creep of various materials is presented, including a resumé of the author's experience on the rheological behavior of concrete.

Special and complex bodies are described, and it is shown how they can be built up in the form of mechanical models and rheological equations from the three ideal bodies.

A well-explained systematic notation is used throughout. The bibliography is in alphabetical order of authors; however, the reference numbers are in the order in which the paper is quoted in the text. A few reference numbers quoted are lacking from the bibliography. For the convenience of the reader the appropriate symbol is given after all quantities in the index.

The book is written with a clear informal method of presentation. Even though it is more elementary and less mathematical than Reiner's earlier book, some previous knowledge of rheology would be of assistance to the reader.

"Deformation and Flow" offers little assistance on topics such as viscometry, sizing of pipelines for the flow of slurries, and agitation of suspensions, but is well recommended to those chemical engineers desiring an interesting introduction to theoretical rheology.

### The Big Four

ORGANIC CHEMISTRY. Fourth English edition. By Paul Karrer. Elsevier Publishing Co., New York. 973 pages. \$8.50.

As in earlier editions, the subject has been broken down into four major sections: aliphatic, carbocyclic, heterocyclic compounds and organic compounds with heavy hydrogen and heavy oxygen. Further division has been made according to the compounds' functional groups.

Results of the latest investigations have been included throughout. New sections can be found on polysiloxanes and other organic silicon compounds, diacyl peroxides and peracids, streptomycin, organic compounds containing isotopic carbon and nitrogen. Substantial changes appear in the

chapters on elementary microanalysis, mineral oil products, organic lithium compounds, oestrogenic substances (doisynolic acid, synthesis of oestrone), vitamins (pteroylglutamic acid, vitamin A), the coloring matter of blood and related compounds, alkaloids (retroecine alkaloids, solanine solanidine, N-methylmorphinan synthesis, etc.), and cyclooctatetraene.

The volume remains a manageable size while doing a comprehensive job of covering the field.—FA

#### Unit Operations Applied

NATURAL GAS AND NATURAL GASOLINE. By R. L. Huntington. McGraw-Hill Book Co., New York. 598 pages. \$7.

Reviewed by Kenneth A. Kobe

Professor Huntington of the Department of Chemical Engineering of the University of Oklahoma has been a steady contributor to the journals in the petroleum field, especially the *Petroleum Refiner*, on the application of unit operations to fractionation and other vaporization processes, on the flow of gas in pipelines, dehydration of natural gas, and other research topics in this field of natural gas and natural gasoline. Most of this material has been gathered together for his book, much has been revised for presentation here, but many references are familiarly those of the early papers.

The book presents 11 chapters and an appendix: introduction, estimation of gas and gasoline resources, elements of plant location and design, gathering of raw gas and return of residue gas, determination of cycling efficiencies in the Cotton Valley (Louisiana) gas-condensate reservoir, elements of natural-gasoline processing, absorption distillation and fractionation, gas dehydration, storage and transportation, high-pressure pipeline research, and the appendix. Chapter 5 on cycling efficiencies in the Cotton Valley reservoir is from the professional engineering thesis of R. L. Hock and represents field data from this area. Chapter 9 on gas dehydration is by Professor L. S. Reid, who has published considerable research in this field. Professor F. C. Fowler was a co-author of the chapters on absorption, distillation and fractionation.

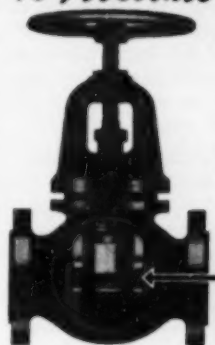
In his preface, Professor Huntington states that the book has been prepared primarily for engineering students taking courses in the production of natural gas and the manufacture of liquefied products. Such courses are in natural-gas and petroleum engineering departments and may be

(Continued)

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BOOKSHELF, cont. . .

elective courses in chemical and mechanical engineering. In those chapters dealing primarily with the elements of natural-gasoline processing, absorption, distillation and fractionation an excellent job has been done in starting with fundamentals and building to equations valid for multi-component hydrocarbon mixtures. Chemical engineering students and teachers will find those chapters useful in the presentation of these unit operations. Other chapters have not been started so fundamentally and an instructor must precede these chapters with a more complete explanation. For example, it might appear that in order to understand the need for the cycling of gas in high pressure fields that a fundamental explanation of the phase diagram of a hydrocarbon mixture would be given and the retrograde condensation and vaporization effects be explained from it. None is given, and even the index refers to a page that does not mention the phenomenon.

Chapter 11 on high-pressure pipeline research makes available again the research carried out at the University of Oklahoma in cooperation with Clark Brothers Co. as Project 49. This mathematical treatment of high-pressure gas flow can be used in all courses in flow of fluids.

An extensive collection of excellent problems is found at the end of each chapter and a sufficient number of illustrated problems is given to assist in their solution.

This book will be welcomed, not only by the young engineers in the natural gas and natural gasoline industries, but also by those in chemical engineering operations in petroleum refineries in which absorption, distillation and fractionation are important unit operations.

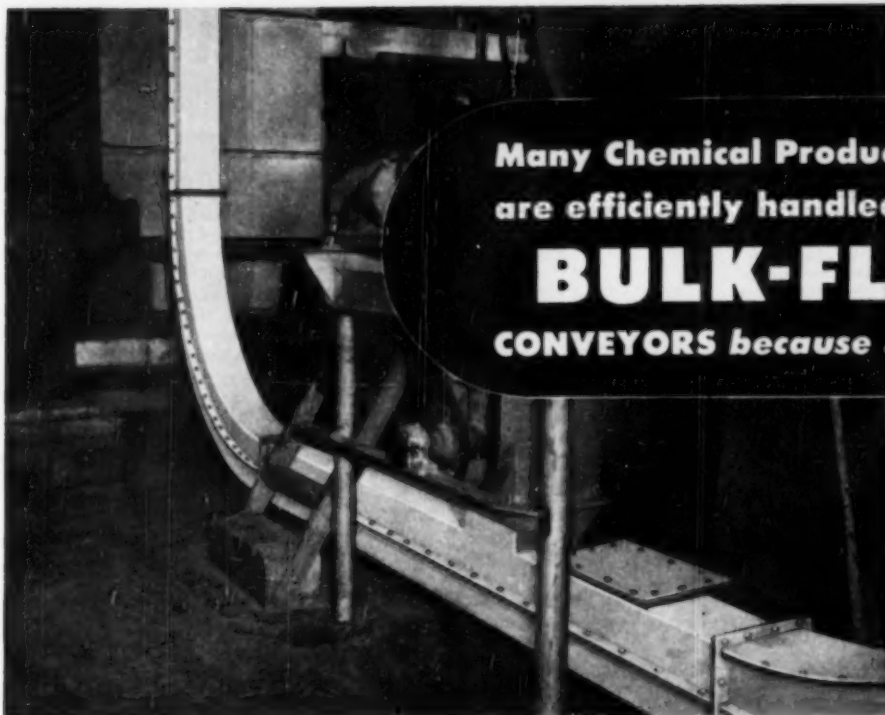
### Introducing a Series

THE HETEROCYCLIC DERIVATIVES OF PHOSPHORUS, ARSENIC, ANTIMONY, BISMUTH, AND SILICON. By F. G. Mann. Interscience Publishers, New York. 180 pages. \$5.25.

Reviewed by Edgar A. Steck

This volume is the first to be issued in a series entitled "The Chemistry of Heterocyclic Compounds" having Arnold Weissberger as consulting editor. Since it is part of a projected collection of 28 volumes, it is only reasonable that subscribers to the set should receive the work at somewhat lower cost (\$4.20).

One is inclined to form certain opinions of a large compilation from  
(Continued)



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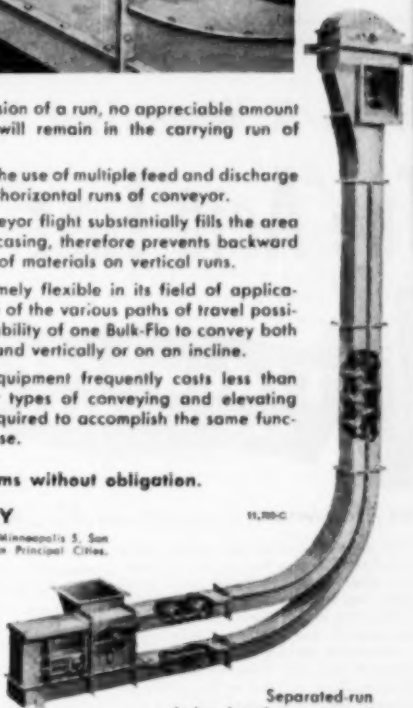
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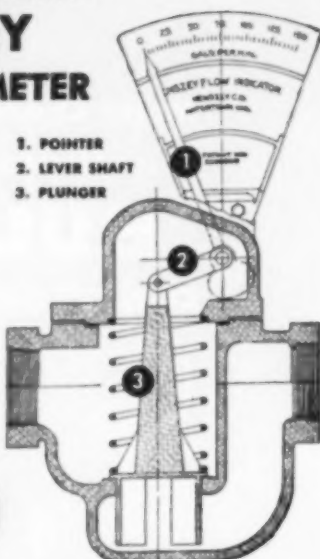
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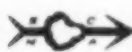
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BOOKSHELF, cont. . .

the study of the first portion of it which becomes available. This modest-size volume at rather high price fulfills most, if not all, of the expectations of the reviewer and launches the series on an even keel. Not only has an expert in the art been chosen to handle the little-explored heterocyclic compounds discussed, but also a careful author. The theoretical and practical aspects of compounds involved are well-blended with suggestions for additional investigations. Many will be pleased to note that the biological activity is included and that the nomenclature employed is clearly stated and consistent. The author, too, should be pleased with the handling given his monograph with clear type used on good paper in an attractive binding.

The table of organization for the series indicates that the rapid expansion in the study of heterocyclic compounds has been recognized. A need for a compendium has existed and since the present one is the first to have been developed, the publishers have good prospects even though many may cavil at the costs imposed.

### Learn From the Laundryman

THE FUNDAMENTALS OF DETERGENT. By William W. Niven, Jr. Reinhold Publishing Corp., New York. 256 pages. \$5.50.

Reviewed by A. H. Pope

This book was written under the sponsorship of the American Institute of Laundering and has the laundryman's special applications constantly in mind. Even so, the principles involved are fundamental so any detergent chemist would profit by studying this text.

The book is divided into two major portions. Part I "Fundamental Considerations of the Detergent Process" is a comprehensive discussion of the theory of detergents. The author has tried to bridge the gap between general and specialized information. While this discussion is very excellent some will feel that the author has devoted too much space to the discussion of controversial physical chemical theory. The text of this section discusses detergents, the chemistry and surface activity of detergent solutions (with and without builders), the nature and properties of builder solutions, and the electrical phenomena in detergent.

Part II of the text deals with the "Practical Considerations of the Detergent Process." This portion of the text is specifically concerned with the

(Continued)

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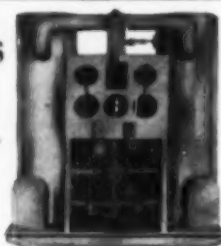
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### BOOKSHELF, cont. . .

laundry interests. The author discusses the nature of soils, the mechanism of their removal and dispersion, and offers a comprehensive summation of detergent action.

The book is much in the nature of a review and as such has an abundance of references and data, the latter mostly in the form of graphs. One can find data and opinions with which he disagrees but these are trivial and, on the whole, the author has been very successful in writing an excellent book on surface chemistry and the principles of detergency for the average chemist.

### The General Picture

PATENT PRACTICE AND MANAGEMENT FOR INVENTORS AND EXECUTIVES. By Robert Calvert. Scarsdale Press, Scarsdale, N. Y. 371 pages. \$5.

Reviewed by A. W. Deller

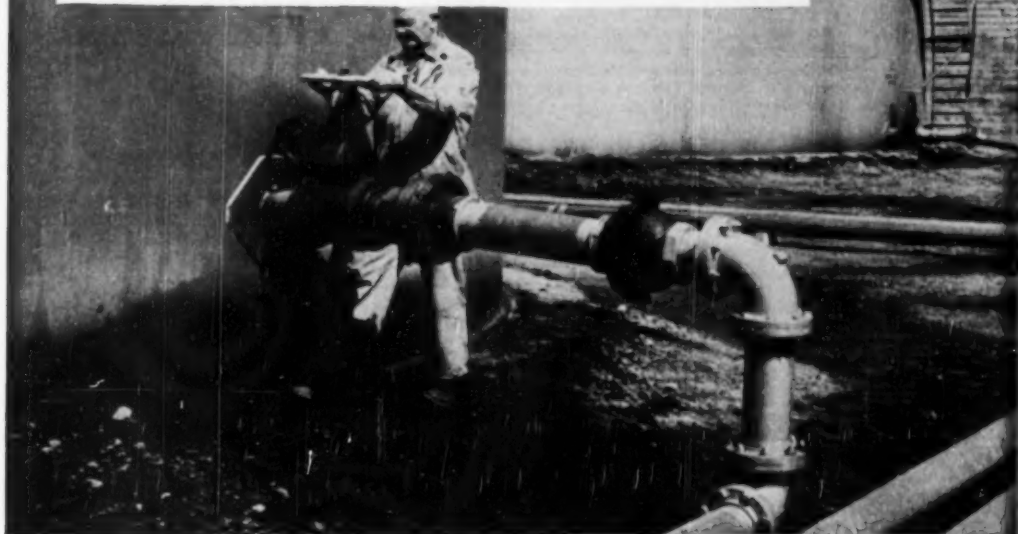
A valuable addition to the literature in the field of inventions and patents and their development is found in Mr. Calvert's "Patent Practice & Management." The book does not profess to be a text on patent law. Neither does it subject the layman to the dangers of a little legal knowledge. As its title indicates, the book is designed to sketch broadly for inventors and executives a general picture of the nature of inventions and the desirability of patents, the problems which may arise, and the pitfalls to be avoided. At the outset, the question is raised and answered in the opening chapter, "What to Patent." Thereafter, the author discusses what is patentable and what is unpatentable under the patent laws, when a patent should be applied for, and, most important—particularly in an organization where various people are working on numerous problems—"Who Is the Inventor and Importance of Proper Selection."

Two chapters, "Special Incentives for Inventors and Executives" and "Patent Rights of Employers and Employees and Employment Contracts," deal with the important questions arising out of employment, regardless of whether an individual is specifically hired to invent or not. There follows a discussion of the preparation and prosecution of the patent application, establishing the date of invention, the keeping of research records, and Patent Office procedure, organization and psychology.

Another section is devoted to the commercialization of patents, problems of licensing, misuse of patents, (Continued)



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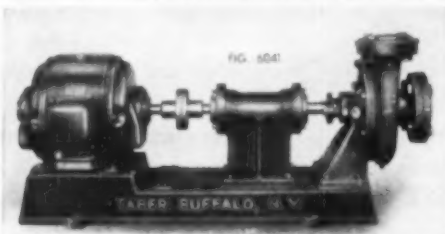
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### BOOKSHELF, CONT.

infringement, and what the measure of liability may be, if infringement is found.

Of particular interest and help are the chapters on the advantages and disadvantages of foreign patents and the tax law of research, invention, and patents. A glossary of terms in common usage, an appendix of forms, an index of cases and authorities, and a subject index, complete this very practical and helpful text.

While not designed to make each man his own patent attorney, Mr. Calvert's book will prove valuable in alerting inventors and executives to the problems arising in connection with research, inventions and patents, and in averting serious error before consulting patent counsel.

### Reverse Appendectomy

THE PHYSICAL CHEMISTRY OF ELECTROLYTIC SOLUTIONS. Second edition. By Herbert S. Harned and Benton B. Owen. Reinhold Publishing Corp., New York. 645 pages. \$10.

Reviewed by Victor K. La Mer

The second edition of this comprehensive well-known treatise differs from the first edition in the addition of 36 pages in the form of appendixes. The authors state in their preface:

"While part of our original text was in press in 1941, revised tables of fundamental constants were published by Birge. At that time, it was decided to make no change in the numerical tables of physical constants, characteristic slopes and mathematical functions in Chapter 5. Had we decided to make this change, all of the numerical tables would have been inconsistent with the actual calculations in the book. In this edition we have not altered the tables in Chapter 5 for the same reason, but have incorporated in Appendix B revised values of those quantities affected by changes in the fundamental constants. This procedure leaves the original text representative of the calculations during the three decades preceding 1940, and we believe that this is the most unequivocal way of meeting this unfortunate complication.

"Appendix B is comparatively short, so no subject index for it has been included. Instead, a detailed Table of Contents and a separate Author Index are supplied. The sections in Appendix B are designated consecutively, (B-1), (B-2), etc., and the equations are numbered, (B-1-1), (B-10-4), etc., where (B-1-1) is the first equation in Section (1), (B-10-4) is (Continued)

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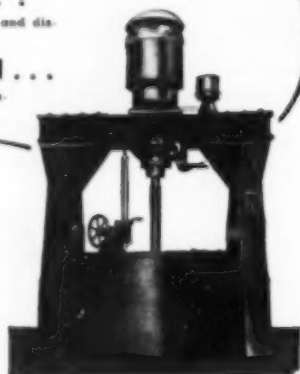
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BOOKSHELF, CONT.

the fourth equation in Section (10), etc. The Figures and Tables are similarly designated. Cross references between tables in the main body of the book and Appendix B have been introduced."

### Reagent and Catalyst

BORON TRIFLUORIDE AND ITS DERIVATIVES. By Harold Simmons Booth and Donald Ray Martin. John Wiley & Sons, New York. 315 pages. \$5.

Reviewed by Johannes S. Buck

This book is, with one exception, a very thorough and painstaking piece of work. It embodies a great deal of difficultly accessible material and the reviewer is glad to see that the patent literature has not been neglected. The book should prove valuable to both inorganic and organic chemists and will be a great timesaver to any person interested in this important reagent and catalyst.

The book itself is attractively printed in a very readable type and is exceptionally free from typographical errors. Adequate author, subject and formula indexes are included.

The one criticism that the reviewer can make is of Tables 35, 37, 38 and 40, dealing with steroid compounds. The terminology used is heterogeneous and largely obsolete and there are some errors, so that the tables contrast strangely with the rest of the book, which has been prepared with meticulous care. Perhaps the authors were unfortunate in their selection of a collaborator.

To the reviewer, the book is comparable to an ACS Monograph and he has no hesitation in recommending it.

### Brass

HOCHOFEN-SCHLACKE. (Blast furnace slag.) By Fritz Keil. Stahlisen, Dusseldorf, Germany. 346 pages. 32.50 marks.

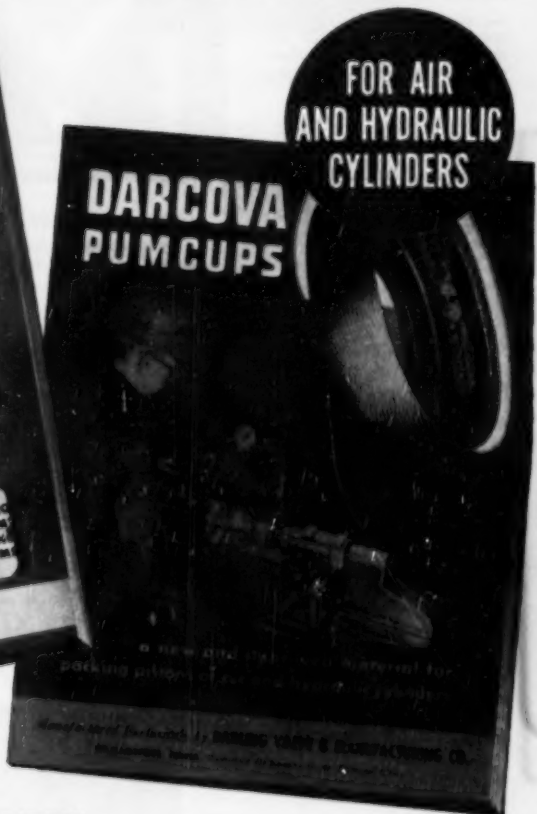
Reviewed by W. Trinks

Keil's book is very much more complete than the well known older book by Guttman on the same subject (published 1919 and 1934). Slags of all types and compositions are described in 44 pages. The differences between the properties of blast furnace slags and those of other slags are emphasized. The production and utilization of quickly cooled slag are treated on pages 45-153. This section includes the production of granulated slag, its use for cement, for brick-

(Continued)

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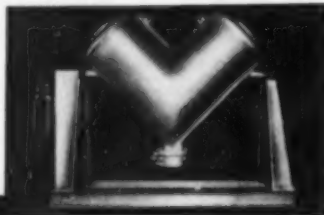
### faster mixing action

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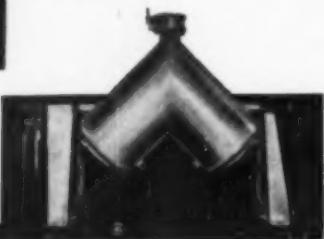
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\*Patents Pending

### BOOKSHELF, cont. . .

making, and for the making of slag-pumice stone, which latter is used in the production of lightweight bricks and lightweight concrete. Both are extensively used in building construction and are excellent heat insulators.

Pages 154-255 deal with slowly cooled, chunky slag, its selection, its crystallization, and with the methods of breaking the chunks into smaller pieces. The casting of paving blocks and of foundation blocks is described, and so is the use of broken slag for concrete roads as well as for bituminous roads. Cast slag blocks also serve for pavement and in walls on the banks of rivers, canals, and harbors. The use of broken slag for railroad bedding is discussed in detail.

On pages 256-280 miscellaneous products and uses of blast-furnace slag are discussed, such as the production and use of slag wool. This section also deals with the use of slag as fertilizer, as filler for worked-out sections of mines, and as ingredient in the making of glass.

The whole book is well illustrated, both by line-cuts and by halftones.

A very extensive bibliography is given and at the end 30 pages contain German laws and ordinances concerning the use of slag products.

"Hochofen-schlacke" was written with the usual German thoroughness. It is interesting to learn from this book how much is to be known about the properties, use, and testing of blast furnace slag and of the products made from it.

### Yes, Another

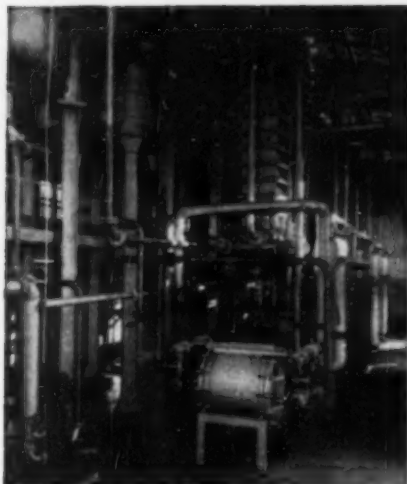
LUMINESCENCE OF SOLIDS. By Humboldt W. Leverenz. John Wiley & Sons, New York. 569 pages. \$12.

Reviewed by C. E. Barnett

When I first learned that Mr. Leverenz was planning a book on luminescence, by reaction was that it could not be—not another book on luminescence. It must be said that he has written a very excellent one. In the preface, Mr. Leverenz says his book is designed to provide an introductory and useful description of luminescent solids in language comprehensible to science graduates. It probably will turn out to be equally useful for bringing together in one place so much of the author's work. A good bit of this is found in patents, government reports, and the RCA Review. These are not so accessible as the standard technical journals to many people.

The chapters are: the elements of matter and luminescence; solids; syn-

(Continued)



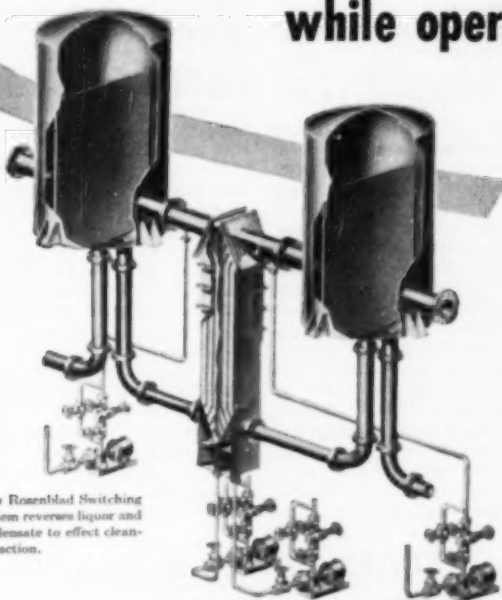
Evaporator installation with Rosenblad® Channel Switching System.

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### BOOKSHELF, CONT.

thesis of luminescent solids; constitutions, structures, and energy levels of phosphors; luminescence of phosphors; general properties of phosphors; uses of phosphors. The first two chapters are on fundamental characteristics of crystalline solids, the next three apply this to phosphor crystals and the last two are concerned with the properties of useful phosphors.

Mr. Leverenz has introduced some features that will be appreciated by readers. Among them are the liberal use of bold face type to point up terms under discussion and the cross referencing of figures. By this means one figure is made to serve as an illustration of discussions at several different places in the book. References to the current literature are good. The arrangement of the subject matter is logical and well adapted to indicating the relation between topics and to giving a coordinated picture of the field. The book is recommended to any one seriously interested in the broad fundamentals of the luminescence of solids.

### Current Practice

**WELDING HANDBOOK.** Third Edition. Edited by Simon A. Greenberg. American Welding Society, New York. 1,650 pages. \$12.

The welding field has been broken down into processes, materials and applications. One group of 27 chapters describes current welding and cutting processes. Equipment, fundamental method and variations for different metals and applications are given for each process. Thirteen chapters cover commonly welded ferrous and non-ferrous metals: how they respond to various welding processes, general properties. Another group of chapters is on design, material, workmanship and inspection requirements for industrial applications. Material in each chapter within a group is arranged in the same general order. Individual chapters cover cost estimating, welding metallurgy, physics of welding, general engineering tables.

The text, considerably increased in this edition, has been set on two columns and more data has been presented in tabular form. There is a 69-page index; both index and text have been cross-referenced.—FA

### Most Complete

**EXPERIMENTAL PHYSICAL CHEMISTRY.** Fourth edition. By F. Daniels, J. H. Mathews and J. W. Williams. McGraw-Hill Book Co., New York. 568 pages. \$4.50.

Reviewed by Pierre R. Gendron

The fourth edition of this classical textbook is a great improvement over the previous edition. It might even be said that it is an entirely new book. As in the former edition, the book is divided into two parts: I, Laboratory Experiments; II, Apparatus and Methods.

In the first part, seven new experiments have been added: two on radiochemistry, two on chemical kinetics, and one each on high polymers, chromatography and gas adsorption, thereby keeping up with the rapid progress that has been achieved in all of these fields.

Most of the other experiments have been rewritten and brought up-to-date. Much of the apparatus used for the experiments has been redesigned and a number of new drawings of modern apparatus, such as the Beckman Spectrophotometer and the Cenco-Sheard, have been included.

Although the number of references listed is limited, it is felt that the most important articles and books on the various subjects are mentioned.

The second part of the book has also been greatly improved. Notable among the revised chapters are those on the "Treatment of Experimental Data," "Electronics," and "Isotopes and Radioactivity."

All these improvements make this revised edition the most complete textbook in the field, and this reviewer believes that the authors and publishers deserve special credit for having brought together all this material in a book whose price is within the means of all university students.

## RECENT BOOKS & PAMPHLETS

**Petroleum Horizons.** Thirty-one flow diagrams of petroleum refining and petroleum chemical processes, including typical operating data, are reproduced in two colors—with color functionally used to facilitate tracing major stream from charge to products. Hard cover. 80 pages. The Lumus Co., 420 Lexington Ave., New York 17, N. Y.

**Formaldehyde.** Properties and essential information for safe handling and use. 13 pages. 50 cents. Chemical Safety Data Sheet S(D-1), Manufacturing Chemists' Association, 246 Woodward Bldg., Washington 3, D. C.

**Equipment Replacement.** "Replacement Manual." To replace or not to replace your equipment. Manual arranged in two main divisions: the first deals broadly with equipment policy; the second is concerned with detailed application of a procedure for replacement analysis. 75 pages. \$3. Machinery & Allied Products Institute, 120 South LaSalle St., Chicago 2, Ill.

**Nuclides and Isotopes.** Wall chart of nuclides (26 by 50 in.), arranged in three overlapping sections. Numbers along the

(Continued)

Chemical carrier *Marine Chemist* after conversion by Bethlehem. Inset shows a filling and discharge station on the *R. E. Wilson*, another Bethlehem conversion.



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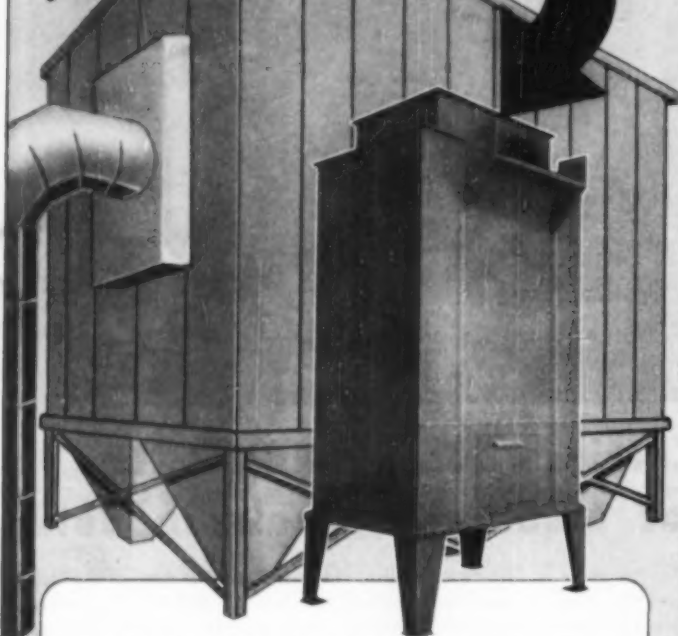
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### BOOKSHELF, cont. . .

left-hand side, marking horizontal rows of spaces, give number of protons in each nucleus. Thus each horizontal row represents one element and the number of spaces that are filled show its known isotopes. Spaces shaded in gray represent stable, naturally occurring isotopes; those in black, radioactive isotopes occurring in nature. The chart is discussed and explained in an accompanying booklet. By James Stokley. 8 pages. General Electric Co., Dept. 60221, Schenectady 5, N. Y.

**Peroxide Bomb.** Instruction manual for macro, semi-micro and micro sodium peroxide combustion bombs. 48 pages. Manual No. 131. Parr Instrument Co., 211-53rd St., Moline, Ill.

**Ethyl Alcohol.** "Corn as a Raw Material for Ethyl Alcohol." Study on the feasibility of making ethyl alcohol from corn; how it stacks up against other manufacturing processes. By L. K. Arnold and L. A. Kremer. 103 pages. Bulletin 167, Iowa Engineering Experiment Station, Ames, Iowa.

**Steel Products Manual.** Chemical composition, physical properties in the annealed condition, thermal treatment, representative mechanical properties for stainless and heat resisting steels. 150 pages. 25 cents. Section 24, American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y.

**Chemical Engineering Design.** "A Problem in Chemical Engineering Design: The Manufacture of Mononitrotoluene." Refresher course demonstrating how a chemical engineering design problem should be tackled. By J. M. Coulson and F. E. Warner. 16 pages. 15 s. 6d. Institution of Chemical Engineers, 86, Victoria St., London, S. W. 1, England.

**Selling to the Government.** How to get on lists of bidders to receive invitations-to-bid, what the government will want to know about the company, how to get spot information from government agencies and private publishers. 64 pages. 50 cents. Chamber of Commerce of the United States, Washington, D. C.

**Fertilizer Industry.** Extended summary of the problems of production and distribution of fertilizers and fertilizer chemicals supported by statistics. Federal Trade Commission report. 28 cents. Superintendent of Documents, Washington 25, D. C.

**Analysis.** "Testing by the National Bureau of Standards." Description of policy, fee schedules and other general information to facilitate use of bureau's facilities for testing or cooperation in testing with industry. 25 cents. Circular 483, Superintendent of Documents, Washington 25, D. C.

**Uranium.** "Uranium Exploration in the United States." An address by Phillip L. Merritt, April 18, 1950, discussing American occurrences and some of the AEC policy and program. Atomic Energy Commission.

**Soap and Glycerin.** "Soap and Glycerin Manufacture, 1947 to 1948." Statistical analysis of productivity. Mimeographed. LS50-3241, Bureau of Labor Statistics.

**Cane Sugar.** "Cane Sugar Refining 1946 to 1948." A statistical analysis of productivity. Mimeographed. LS50-3535, Bureau of Labor Statistics.

**Leather.** "Selected Types of Leather, 1946 to 1948." A statistical analysis of productivity. Mimeographed. LS50-3597, Bureau of Labor Statistics.

**Labor.** "Guaranteed Employment and Wage Plans." Part of the "Collective Bargaining Provisions" series. Quotes salient paragraphs from actual labor contracts. 20 cents. Bulletin 108-15, Superintendent of Documents, Washington 25, D. C.

**German Patents.** "Subject Outline of the Unpublished Applications for Patents filed at the German Patent Office, 1940-1945." Index to the 200,000 German applications filed in the Berlin Patent Office; breaks them down in 13 major industrial groups, 53 classes and some 500 subclasses. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

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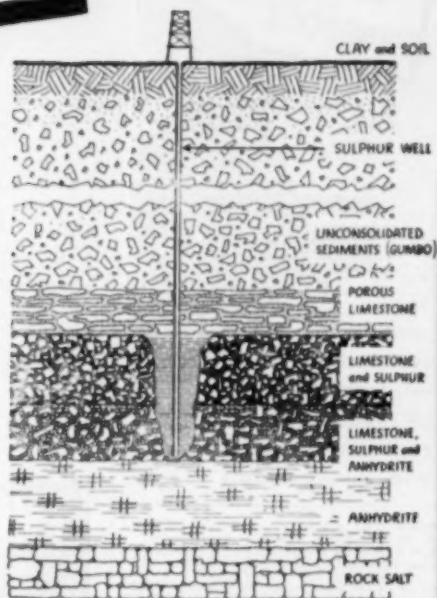
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ducers for capacities up to 1000 hp. De-  
scribes single, double and triple reduction  
units, horsepower rating tables for stand-  
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load rating tables, dimensions and weights,  
selection chart. 25 pages. H-18. De  
Laval Steam Turbine Co.

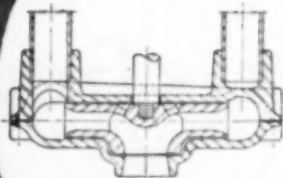
(312L)  
**Organic Chemicals.** Lists company's prin-  
cipal products, their specifications and  
uses. 4 pages. Edwal Laboratories Inc.

(312M)  
**Water Conditioning.** Step-by-step descrip-  
(Continued)

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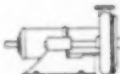
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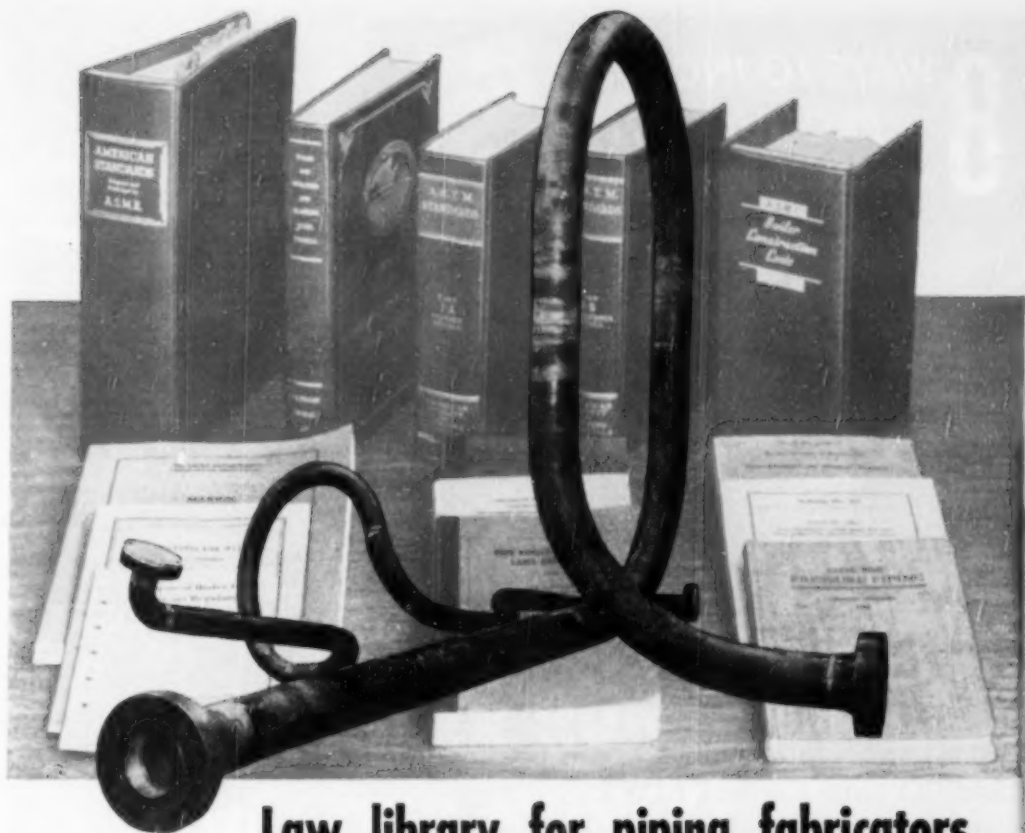
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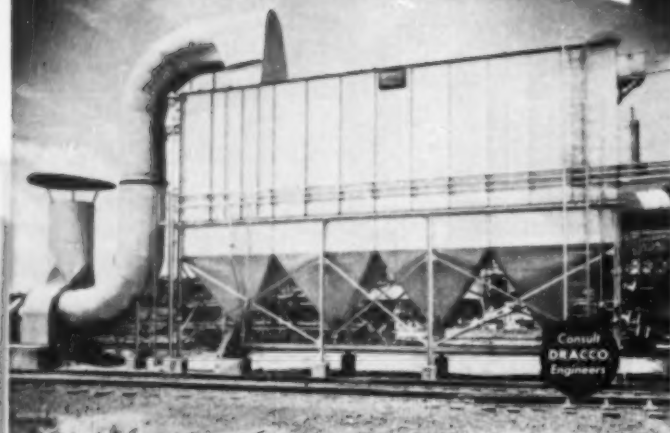


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tion of operation of unit for cold process water treatment. Typical flow diagrams and installation photographs. 12 pages. WC163. Graver Water Conditioning Co. (214A)

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**Boiler Treatment.** A monthly news bulletin on an organic boiler treatment made from chemicals taken from selected cedar wood. April 1959, 2 pages. Portland Shingle Co. (214G)

**Instruments.** Differential pressure transformer for indicating, recording and controlling rate of flow. Cross-sectional view with color key shows operation. Blueprint shows outline dimensions. 4 pages. 2250. Hagan Corp. (214H)

**Extrusion Presses.** Pictures present for aluminum, copper and alloys; lead pipe and fittings; lead encasing for hose and electric cable; carbon. 8 pages. 14-1. Lake Erie Engineering Corp. (214I)

**Molybdenum.** Methods and procedures for forming and fabricating. 2 pages. 4-303. Pansteel Metallurgical Corp. (214J)

**Tanks.** Calibrating tanks for refineries, terminals, pipe lines, tank trucks, loading racks. Pictures show models which range from 50 to 2,000 gal., stationary or portable, with or without springs, open or closed necks. 6 pages. CT-101-50. Warner Lewis Co. (214K)

**Resins.** Appearance, properties, shipping information and applications of each resin. Pocket-sized booklet. 12 pages. Vallie Corp. (214L)

**Pumps.** Air-cylinder powered chemical pumps, automatic chemical feed and automatic hydrostatic test pressure systems. Sketches show typical systems. Cutaway drawings and photographs show construction. 16 pages. Milton Roy Co. (214M)

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Idlers, belts and machinery parts should be inspected periodically, depending upon amount of use. Greasing and servicing should be done as indicated by inspection. (Normally, 1000 operating hours is the average greasing period). Inspection should include the following checks:

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- 2 All rolls properly seated in brackets.
- 3 No unusual damage to rolls, brackets or base.
- 4 Evidence of adequate greasing at seals but no excessive amount. Don't overgrease.
- 5 Check for accumulation of material under rolls. Keep deck plates clean.
- 6 No buildup of material on return rolls.
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4 pages. 145. Another booklet on hydraulic couplings contains sketches showing installation possibilities, performance charts. 12 pages. 134. A third booklet contains cutaway drawings and photographs showing parts and operation of hydraulic torque converter. Detailed sketches give installation data. 16 pages. 125C. Twin Disc Clutch Co.

(S17A)

**Heat Exchanger.** Air-cuprous, removable tube bundle construction. Photographs show range of models; cutaway drawing shows parts. Standard sizes and dimensions for screw and flanged connections. 8 pages. 22K1. Ross Heater & Mfg. Co.

(S17B)

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(S17C)

**Rotating Equipment.** An illustrated article, "Care of AC Rotating Equipment." Drying moist insulation, measuring insulation resistance, bearing clearances and proper machine applications. 24 pages. 95H7417. Allis-Chalmers Mfg. Co.

(S17D)

**Corrosion Resistance.** Results and methods of testing for resistance of nickel and its alloys to corrosion by caustic alkalies. Performance data tabulated for such fields as viscose rayon, soap, pulp and paper, petroleum. 24 pages. T-6. International Nickel Co.

(S17E)

**Pumps.** Vertical, centrifugal, multi-stage, close-coupled process pump for limited net positive suction head applications. Fully labeled sketch aids construction description. 4 pages. B-592. Food Machinery and Chemical Corp., Peerless Pump Division.

(S17F)

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(S17G)

**Instruments.** Material and arrangement selection data for control linkage and accessories. Control drive and its individual parts are sketched, with dimensions given throughout. Typical arrangements are shown. 16 pages. CA942. Bailey Meter Co.

(S17H)

**Refractories.** Chart gives uses, softening point and other properties for a line of cements and mortars, plastics, castables, coatings, fire brick. 6 pages. 128 A. Laclede-Christy Co.

(S17I)

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(S17J)

**Resins.** A pale-colored, amorphous, thermoplastic acidic resin for use in protective coatings. Physical, chemical and general properties; preparation. Describes use in esters, maleic-modified and phenolic-modified resins, varnishes, metal resins, gloss oils. 26 pages. Hercules Powder Co.

(S17K)

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**Centrifugal Pumps.** Sectional view with features pointed out and described. Various types of drives are illustrated. 4 pages. 7212. Ingersoll-Rand Co.

(S17M)

**Instruments.** Two bulletins. One contains schematic drawings showing the use of displacer buoys. 2 pages. 10234. The other features a line of mercury manometer flow meters requiring no pressure-tight bearings or stuffing boxes; they use close-coupled magnetic clutch with or without pneumatic transmission to a remote location; electric impedance bridge transmitter to transmit to a distant exhibiting instrument; automatic control of the ratio of flow rate of two fluids and others. Sketch of models; engineering and dimensional data. 12 pages. 57. Fischer & Porter Co.

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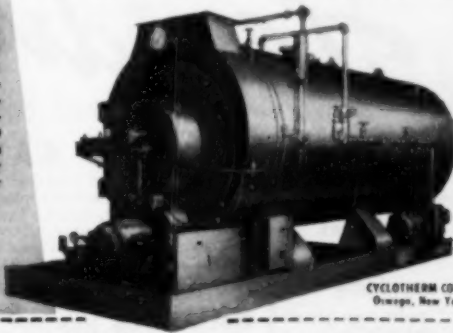
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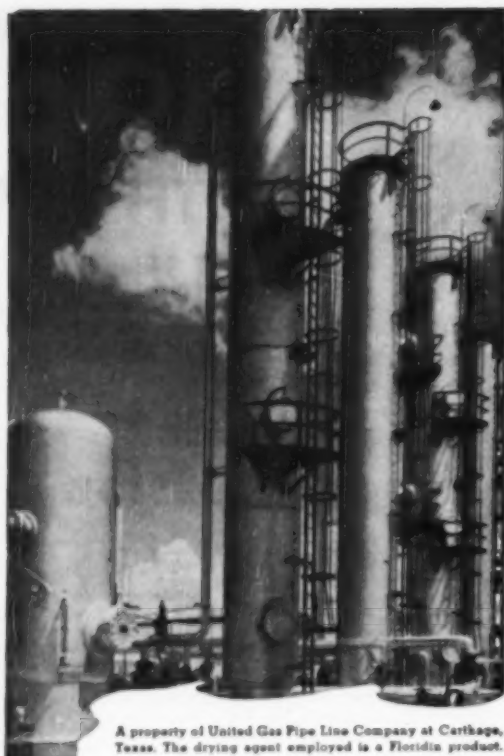
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**Accumulators.** Causes of line shock, characteristic, detrimental effects, formula for determining magnitude under any set conditions, and for determining size of accumulator required. 4 pages. 460. Greer Hydraulics, Inc.

(3184D)

**Materials Handling.** Fork lift trucks, cranes, skid platforms. Photographs, dimensions, price. 8 pages. A. & A. Machinery Corp.

(3184E)

**Castor Oil Products.** Chart gives solubilities in common commercial solvents of castor oil acids, esters; dehydrated and modified castor oils. 4 pages. Baker Castor Oil Co.

(3184F)

**Dipropionitriles.** For three, recently made available; Chart of typical reactions; physical and chemical properties; potential applications as insecticides, plasticizing agents, insecticides and especially as selective solvents. 33 pages. 14. American Cyanamid Co.

(3184G)

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**Couplings.** Two bulletins. One covers construction features, method of selection for engine driven systems and for systems involving shock, and dimensions. Cutaway drawings, charts and sketches. 8 pages. 8105. The other contains application illustrations. 4 pages. 8106. Falk Corp.

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(3184L)

**Paint.** Reference list of metal protective and paint bonding chemicals and processes. 3 pages. 438B. American Chemical Paint Co.

(3184M)

**Surface Active Agents.** Properties, uses and specifications. Data on average wetting times for products in various acid, base and salt solutions; effects of organic solvents on wetting time. 3 pages. F-3560. Union Carbide and Carbon Corp., Carbide and Carbon Chemicals Division.

(3184N)

**Cellular Rubber.** Illustrates the forms in which this cellular rubber can be prepared for insulation purposes. 12 pages. Sponge Rubber Products Co.

(3184P)

**Valves.** Wiring diagrams and dimensional drawings of solenoid air-operated valve. 8 pages. Au250. Bellows Co.

(3184Q)

**Sodium Silicate.** Coating paper with sodium silicate—how to apply the coating, type of silicate to use, dilution. 6 pages. 15-1. Philadelphia Quartz Co.

—End



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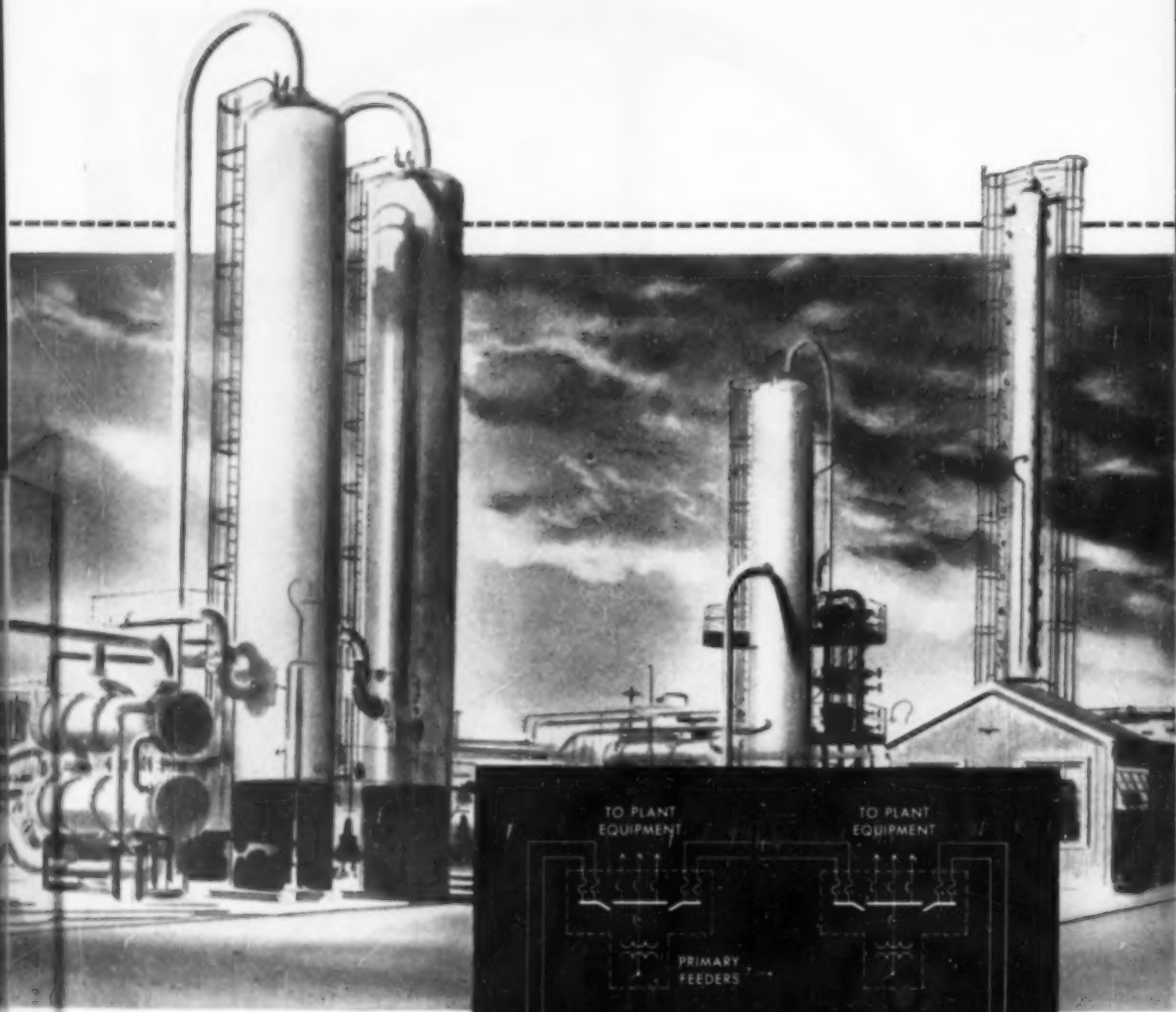
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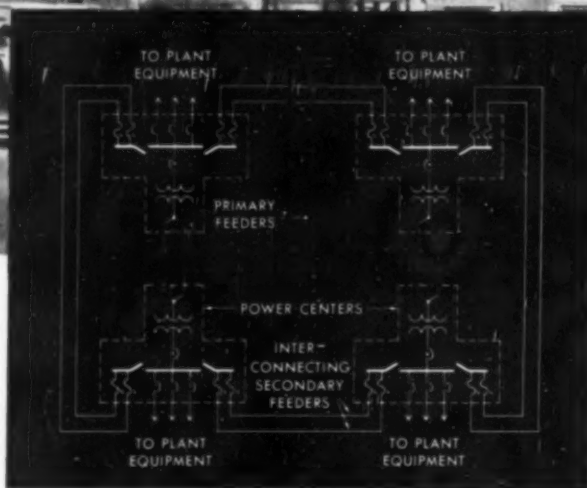


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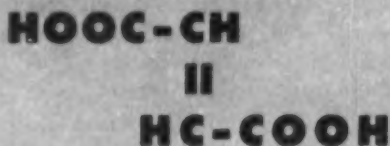
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**A Full-Color Movie:** sound movie dramatizes the economies of system planning. Ask your Westinghouse representative for a free showing.

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ALKYD RESINS  
POLYESTER RESINS  
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# Chemical Economics

RICHARD F. WARREN, Market Editor

## Long Term Growth Trend of Chemical Process Industries Shows Sales Doubling by 1969

The long-term growth trend of our group of U. S. industry is shown in the accompanying chart which plots the value of output of the CPI from 1899 to 1949—with estimates for 1950 and a long-term trend line to 1969. This chart, prepared by *Chemical Engineering*, shows that the chemical process industries will probably double their value of output by 1969.

The physical volume of output for the industries as a whole has almost doubled in the past 10 years. One of the major factors contributing to the steady growth of the industry is the tremendous amount spent on capital expansion each year. Physical capacities in the chemical industry have grown more than 50 percent since the end of the war. According to a survey conducted by the McGraw-Hill Publishing Co. a further increase of about 35 percent is planned for the next three years. These estimates are based on the plans of companies which employ more than 60 percent of the workers in the industries where there are the highest capital investments per worker. With plans for capital expansion exceeding 2 billion per year for the next three years, a further large expansion in capacity will be seen. In fact, about 50 percent of the amount spent on capital expenditures is earmarked for expansion of current facilities—the rest being used for modernization and replacement.

With supply and demand back in balance, many firms are concentrating on the development and expansion of new products. Many chemical firms feel that a large part of the earnings of companies should come from products which are less than ten years old. Among the outstanding examples of this type of reasoning are Union Carbide and Carbon Corp. and Charles Pfizer—Pfizer is earning about 80 percent of their profits from chemicals which are less than ten years old.

The chemical process industries are pouring out a steady stream of new and improved products, processes and equipment. Last year was one of the most productive years yet. Most of

these new products were the fruits of research performed before and during the war—it still takes about seven years to bring a chemical from test tube to the tank car stage. All in all, 1950 should turn out to be a banner year for developments in the fields of medicinals, synthetic fibers, plastics, synthetic organics, and other agricultural chemicals.

### RIISING COSTS

Higher costs and rising wage scales have left their mark on technology and products. More emphasis is being put on answering the questions such as: How can we improve operations, processes and techniques so as to cut costs and increase productivity? How can we make our products from cheaper raw materials? How can we charge packing, handling and transportation costs? The dollar sign is a major motive behind most recent chemical developments.

Extensive basic research is carried out by the chemical process industries. It is their best long-range insurance for a steady growth. Research being carried out today should pay off in the next ten years.

### Price Trends

Among the upward price movements coming soon are price boosts in soda ash, caustic soda, and chlorine. Allied Chemical & Dye Corp.'s Solvay Sales Division will raise its sched-

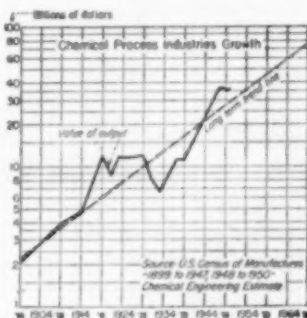
ule 10c. per 100 lb. on soda ash and 15c. per 100 lb. on chlorine and caustic soda in all forms. The increase is effective July 1. The new schedules follow:

Soda ash, 55 percent,	\$ per 100 lb.
Light, bulk, c. l.	1.10
Light, paper bags, c. l.	1.25
Light, bbl., c. l.	1.25
Dense, bulk, c. l.	1.30
Dense, paper bags, c. l.	1.45
Dense, bbl., c. l.	1.55
Caustic soda, 76 percent	
Solid, drm., c. l.	9.20
Flake, ground or powdered, drm., c. l.	8.60
Caustic soda, 50 percent	
Liquid, seller's tank cars, basis 76%, c. l.	2.55
Liquid, rayon grade, seller's tank cars, basis 76%, c. l.	2.65
Caustic soda, 70-74 percent	
Liquid, seller's tank cars, basis 76%, c. l.	2.65
Liquid, seller's tank cars, rayon grade, basis 76%, c. l.	2.75
Chlorine, liquid	
Single unit tank cars, c. l.	2.55
Multiple units, 3 cars (45 tons) per year to one destination, contract customers	3.05
Multiple units, 3 cars (36 tons) per year to one destination, contract customers	3.65
Multiple units, 1 car (15 tons)	4.35
Multiple units, less than 15 tons per year	4.60

Diamond Alkali also has announced that it will raise price schedules effective July 1. Its liquid chlorine prices are broken down into nine quantity differentials in terms of tons. It has announced a price increase of \$2 per ton on soda ash carload prices. Diamond's caustic prices will go up \$3 per ton for liquid, solid, and flake forms. These prices are fob. Painesville, Baldwin, and Houston. However, multi-unit tank cars are not available at Baldwin, Ark. Edgewood, Md., prices on chlorines are 10c. per 100 lb. above the other shipping points.

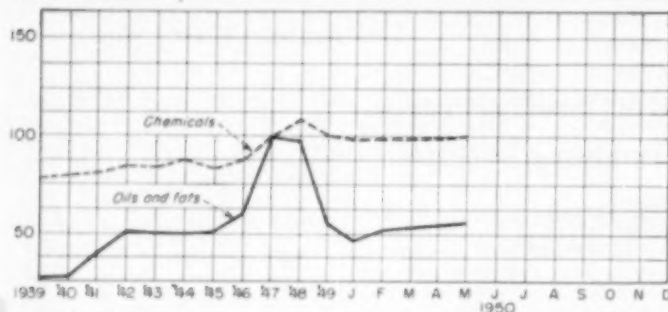
Benzene prices have been moving upward in recent weeks. While many long-term contracts continue at 22c. per gal., at least one producer has hiked the price to 25c. per gal. On June 1, the spot market was hovering close to 40c. per gal. Experts estimate that there is an urgent deficit of about 10-15 million gallons of benzene and that another 10 million gallons would be readily purchased to build up stock if the chemical was made available.

Chemical Engineering's price indexes for chemicals as well as fats and oils crept upward slightly again in June.



# PRICE, CONSUMPTION AND PRODUCTION TRENDS

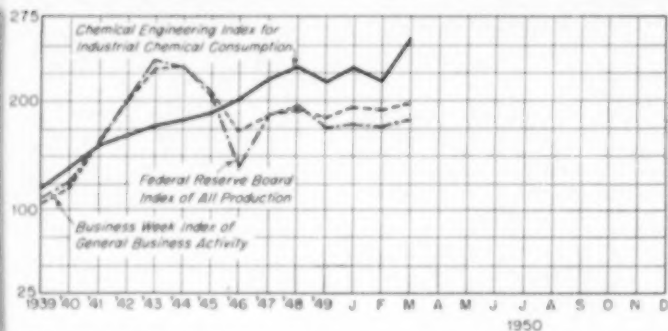
## PRICES



Chemical Engineering's Price Index  
a month, a year, and two years ago

	Chemicals	Oils & Fats
As of June 1	100.32	58.45
Last month	100.00	55.88
June 1949	99.50	52.74
June 1948	109.97	111.46
1947 = 100		

## CONSUMPTION

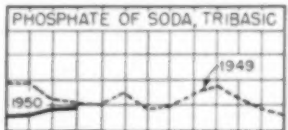
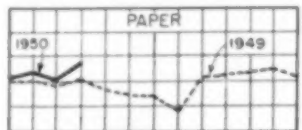
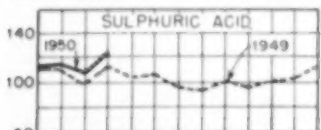
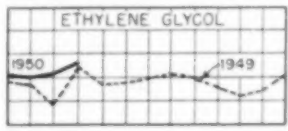
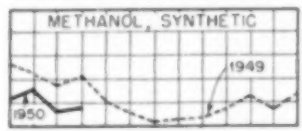
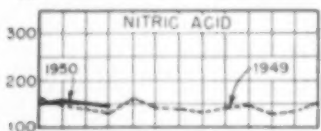
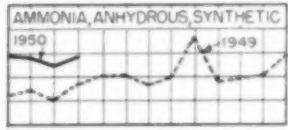
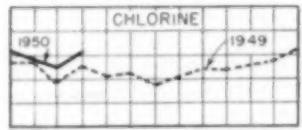
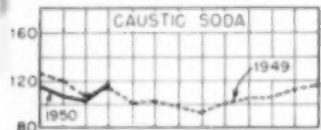
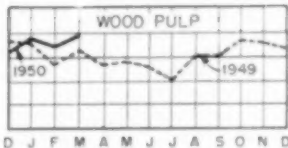
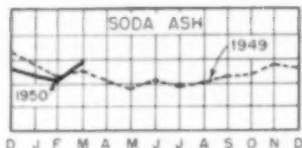
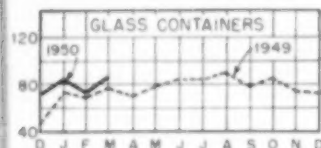


Chemical Engineering's Consumption  
Index for Industrial Chemicals

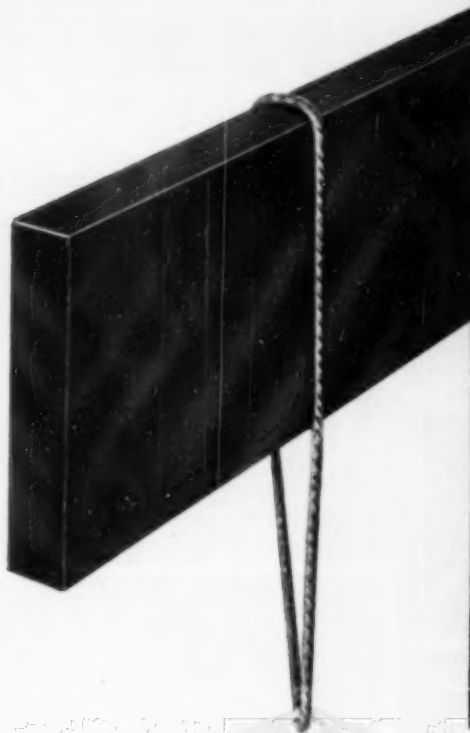
(A breakdown by consuming industries)

	February (Revised)	March
Fertilizers	50.80	81.40
Pulp and paper	23.85	56.55
Petroleum refining	19.31	21.60
Glass	17.32	19.21
Paint and varnish	19.60	24.20
Iron and steel	12.46	13.70
Rayon	27.32	29.76
Textiles	19.85	12.75
Coal products	7.44	8.19
Leather	4.71	5.09
Explosives	5.59	7.94
Rubber	5.10	5.73
Plastics	12.92	15.01
INDEX	217.37	255.01
		1933 = 100

## PRODUCTION



100 = Monthly Average 1947



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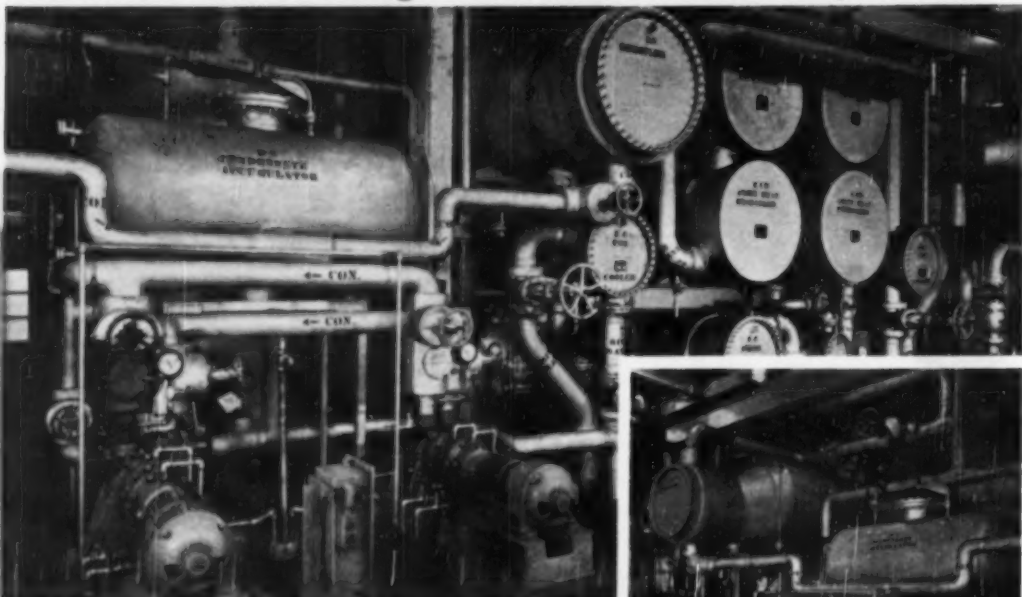
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*Pure Carbonic Company Selects  
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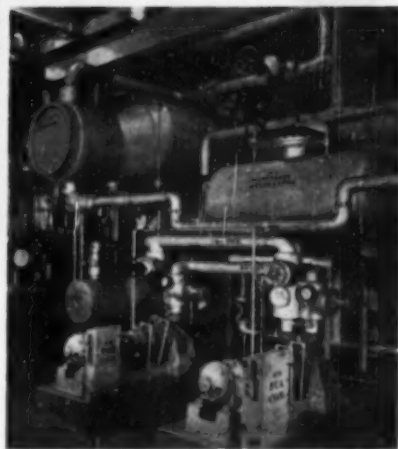


*Several of the 25 exchanger units that were supplied by Alco through Gardiner Corporation for the new plant of Pure Carbonic Company.*

THE installation of twenty-five Alco heat exchangers has helped Pure Carbonic Company, a Division of Air Reduction Company, Inc., to become one of the principal suppliers in the United States of carbon dioxide and "Dry-Ice." The total productive capacity is now more than 140 tons of  $\text{CO}_2$  daily to meet the demands of many expanding markets for  $\text{CO}_2$  in production of carbonated beverages, frozen foods, ice cream and dairy products and many industrial processes.

The Alco equipment installed in the new \$3,000,000 Pure Carbonic Plant included coolers designed for water, acid gas and Amine; reboilers and redistillation apparatus. Combined heat transfer surface in all units is 42,682 square feet.

If you are in the market for heat transfer equipment or are contemplating expansion or the replacement of obsolete and inefficient units, Alco's extensive experience in the design, engineering and fabrication of all types of heat transfer equipment is available to help you. Our engineers will gladly work with yours in working out the most efficient answer to your requirements. Call or write us for further information.

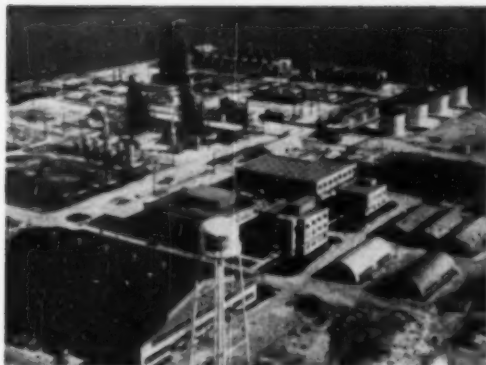


*One of the two reboilers installed is shown in the upper left corner of this photo. Each unit contained 882 tubes and provided 2,760 square feet of heat transfer surface.*

## ALCO

ALCO Products Division  
AMERICAN LOCOMOTIVE COMPANY

ALCO Sales Engineers at New York, Chicago, Kansas City,  
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Plants—Dunkirk, N. Y., Beaumont, Texas.



Plants like this supply world styrene requirements.

#### Commodity Surveys

## STYRENE

**Synthetic rubber pushed its expansion, but plastics are gobbling up more each year.**

Styrene is one of the basic strategic materials of this nation's defense structure. Really large-scale commercial operations started in the war, as a result of the need for synthetic rubber. Since the war's end it has become one of the major synthetic resins used in the plastics industry. It is also moving into the paint industry.

Last year more than 390 million pounds of styrene were made. Of this amount, about 212 million pounds were consumed in the plastics industry. The molding industry takes about 85-90 percent (184 million pounds) of the plastics needs. Miscellaneous plastics uses (excluding protective coatings) take from 3 to 4 million pounds per month.

Every pound of GR-S requires about 0.23-0.3 lb. of styrene. With GR-S production running at 320,000 long tons in 1949, styrene used in the rubber industry amounted to about 165,000,000 lb. The figures show that with plans underway to increase the output of synthetic rubber, consumption in GR-S will be larger this year.

One of the bottlenecks in future expansion of styrene is the shortage of benzene. In 1949, styrene took about 35 percent of the chemical-grade benzene. This year the percentage may reach 37 percent. It is the largest consumer of non-motor grade benzene in the United States. (See *Chemical Engineering*, Jan. 1949, p. 272.) However, there is a bright spot in this picture. Some petroleum companies (such as Pan Am in Texas City) have started to produce benzene from

petroleum. At the present time the price of benzene from petroleum is close to 40 c. per gal. compared with a Gulf Coast price of 25 c. per gal. for coal-tar benzene. Nevertheless the petrochemical producers feel that they may be able to capture a good slice of the benzene market at the higher price if they can guarantee a steady flow of the chemical to customers who have been plagued with coal and steel strikes that periodically shut off their benzene supplies.

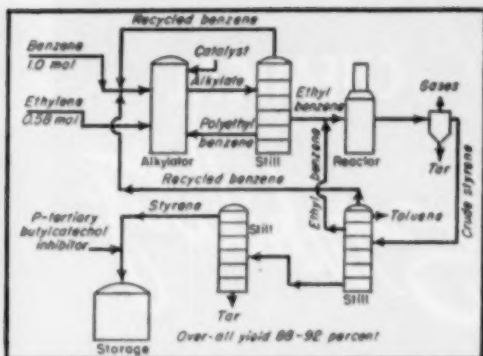
There is also a possibility that petroleum firms eventually will be able to sell 12,000,000 gal. of benzene per year on the Gulf Coast at about 30 c. per gal. (See *Chemical Engineering*, May 1950, p. 73.) With a narrow price differential between the petroleum and coal-tar products a solution of the benzene shortage would be in sight.

Major production method for styrene is the system developed by Dow and put into operation on a commercial scale in 1935. Until the large demands for synthetic rubber developed, Dow remained the sole producer.

As soon as the United States entered the war, natural rubber supplies

#### Four Firms, Six Plants Nearly 300,000 Tons per Year

Company	Location	War-time Capacity	Present Capacity
Carbide and Carbon	Indiopolis, W. Va.	25,000	25,000
Monsanto	Texas City, Tex.	80,000	80,000
Esso	Koblenz, Pa.	37,500	45,000
Dow	Midland, Mich.	4,200	19,000
	Los Angeles, Calif.	30,000	30,000
	Velasco, Tex.	30,000	30,000
Total		191,700	294,000



Processes like this fill rubber, resin, and paint needs.

were cut off. Dow's Midland, Mich., unit was too small to supply the tremendous quantities needed in the synthetic rubber effort. Expansion of the Midland facilities got underway and construction of several other units started in a short time. Dow installed its process in new plants at Los Angeles; Velasco, Tex.; and Sarnia, Ont. It operated these new units in the United States as agents for the Office of Rubber Reserve, and the Sarnia plant for the Polymer Corp. In addition to these expansions, Dow licensed parts of this process to two other producers. As a result, six U. S. plants contributed styrene to the war rubber program.

In April 1947 the Monsanto unit was destroyed by an explosion of ammonium nitrate at a nearby pier. Now rebuilt, this plant is again producing styrene. All of these units except the Dow operated plant at Los Angeles have been sold by the government to the operators.

Here is the basic chemistry of the styrene process that provided 90 percent of the total needed in our war effort: (1) alkylation of benzene with ethylene to form ethyl benzene, (2) dehydration of purified ethyl benzene to yield styrene.

Ethylene and benzene are passed into a tower in the presence of a catalyst. In this alkylation step ethyl benzene, diethyl benzene, and polyethyl benzene are formed. Unreacted benzene and polyethyl benzene are recycled while purified ethyl benzene is piped to a dehydrogenation furnace where it passes over a fixed catalyst in the presence of steam. Products formed are styrene and small amounts of benzene, toluene and tar. Next a delicate distillation is carried out at reduced pressure. Recovered benzene and ethyl benzene are recycled, and toluene is withdrawn as a byproduct. Styrene recovered is 99 percent pure.

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# NEW CONSTRUCTION

## Proposed Work

Ill., Chicago—Reliance Varnish Co., 4601 West Haddon St., plans to construct a 2 story, 40x100 ft. factory addition. Estimated cost \$48,000

Ind., Jeffersonville—Colgate-Palmolive-Pest Co., 108 Hudson St., Jersey City, N. J., plans to construct a 1 story manufacturing plant and warehouse here. Albert Kahn Associated Architects & Engineers, Inc., New Center Bldg., Detroit, Mich., Archts. Estimated cost \$1,000,000

Ia., Fort Dodge—United States Gypsum Co., Inc., Fort Dodge, plans to construct additions to its plant. Estimated cost \$1,000,000

Ky., Brandenburg—Tennessee Gas Transmission Co., Commerce Bldg., Houston, Tex., plans to construct a gasoline processing plant here. Estimated cost \$2,000,000

Ky., Greensburg—Tennessee Gas Transmission Co., Commerce Bldg., Houston, Tex., plans to construct a gasoline processing plant here. Estimated cost \$3,000,000

N. C., Statesville—Robertson Chemical Corp., Wainwright Bldg., Norfolk, Va., plans to construct a fertilizer mixing plant here. Estimated cost will exceed \$100,000

O., Cincinnati—The Formica Co., 4620 Spring Grove Ave., plans to construct a factory containing 100,000 sq. ft. floor space to perform work connected with the laminated plastics division. Estimated cost \$1,000,000. Total expansion program planned by Company \$7,000,000

O., Fairport—Diamond Alkali Co., Painesville, plans to rehabilitate its chromate plant, build magnesium oxide plant, add three new units to chlorine department, expand and modernize washing soda department, new metasilicate plant, remodel research building and expand power plant here.

Pa., Bristol—Rohm & Haas Co., 222 Washington Sq., Philadelphia, plans to construct a factory, laboratory and office building. Estimated cost will exceed \$48,000

Pa., Washington—B. F. Drakenfeld & Co., Inc., plans to construct a laboratory and office building on Wythe Ave. Estimated cost \$150,000

Tex., El Campo—Transcontinental Gas Pipe Line Corp., Oil & Gas Bldg., Houston, plans to construct a compressor station here. Estimated cost \$550,000

Tex., McKee—Shamrock Oil & Gas Corp., McKee, plans to reconstruct the treater unit of its gasoline refinery. Estimated cost \$50,000

Tex., Phillips—Phillips Petroleum Co., Phillips, plans to construct a 20,000 bbl. capacity catalytic cracking unit. Estimated cost \$2,500,000

Tex., Rusk—Valencia Iron & Chemical Corp., Rusk, plans to improve and enlarge its plant. Estimated cost \$1,350,000

Va., Roanoke—Lone Star Cement Corp., 342 Madison Ave., New York, N. Y., plans to construct a plant to have an annual capacity of 1,500,000 bbl. here. Estimated cost \$6,000,000

B. C., Vancouver—Rowater Corp., Corner Brook, N. F., plans to construct a pulp and paper plant here. Estimated cost \$2,500,000

Ont., Cornwall—Howard Smith Paper Mills Co., Cornwall, is having plans prepared for a new plant. Estimated cost \$1,000,000

	Current Projects		Cumulative 1950	
	Proposed Work	Contracts	Proposed Work	Contracts
New England.....		\$72,000	\$2,000,000	\$72,000
Middle Atlantic.....	\$218,000	7,380,000	742,000	30,980,000
South.....	11,100,000	13,272,000	36,318,000	30,531,000
Middle West.....	1,810,000	9,656,000	18,705,000	
West of Mississippi.....	\$380,000	2,988,000	7,863,000	32,566,000
Far West.....			21,236,000	8,678,000
Canada.....	4,711,000	120,000	18,806,000	31,677,000
Total.....	\$23,977,000	\$25,812,000	\$184,118,000	\$126,227,000

Ont., Dryden—Dryden Paper Co., Ltd., Dominion Bldg., Port Arthur, plans to modernize its plant here. Estimated cost \$275,000

Ont., Niagara Falls—F. H. Leslie, Ltd., 7 Cleaton Ave., plans to construct a new plant on Morrison St. Estimated cost \$150,000

Que., Buckingham—High Rock Phosphates, Ltd., 315 West St. James St., Montreal, plans to construct a milling plant. Estimated cost \$100,000

Que., Cap de la Madeleine—St. Regis Paper Co. of Canada, Ltd., Canada Cement Bldg., Montreal, plans to construct a 1 story, 104x180 ft. factory addition.

Que., Montreal—Dominion Glass Co., Ltd., 1111 Beaver Hall Hill, plans to construct an addition to its plant on Wellington St. Estimated cost \$500,000

Que., St. Laurent—Perkins Tissue Mills, Ltd., 424 Guy St., Montreal, plans to construct a 1 story, 159x180 ft. factory on Kings Rd.

## Contracts Awarded

Ark., El Dorado—Pan American Southern Corp., El Dorado, has awarded the contract for the construction of the second unit of a fluid catalytic cracking vapor and recovery unit to Foster Wheeler Corp., Shell Bldg., Houston, Tex. Estimated cost \$2,700,000

Conn., Shelton—Chromium Process Co., Canal St., has awarded the contract for a 2 story, 60x100 ft. factory to John J. Brennan & Sons, 25 Cliff Ave. Estimated cost \$72,000

Del., Wilmington—National Vulcanized Fibre Co., Maryland Ave., has awarded the contract for a 1 story, 75x236 ft. factory to Ruppert Construction Co., 3408 Lancaster Ave. Estimated cost \$100,000

La., Baton Rouge—Ethyl Corp., c/o Albert Kahn Associated Architects & Engineers, Inc., 345 New Center Bldg., Detroit, Mich., has awarded the contract for a central building and storage unit to James Stewart & Co. Inc., Magnolia Bldg., Dallas, Tex. Estimated cost \$672,000

Fla., Palatka—Hudson Pulp & Paper Corp., Palatka, will construct an addition to its plant here. Work will be done by owners. Estimated cost \$10,000,000

Mo., St. Louis—Hardahl Oil Co., Inc., 5706 Natural Bridge Ave., has awarded the contract for a warehouse and office building to Robinson Construction Co., 5540 West Park Ave.

N. J., Monmouth Junction—Columbian Carbon Co., 601 Cam St., Trenton, has awarded the contract for a warehouse and office building to Lewis C. Bowers & Sons, Inc., 180 Nassau St., Princeton. Estimated cost \$250,000

N. Y., Syracuse—Solvay Process Div. of Allied Chemical & Dye Corp., Milton Ave., Solvay, has awarded the contract for a soda ash plant near here to McGraw Construction Co., P. O. Box 272, Middletown. Estimated cost including equipment \$20,000,000

O., Akron—Goodyear Tire & Rubber Co., 452 East Archwood St., has awarded the contract for a 1 story rubber products plant to Clemmer Construction Co., Inc., 134 East Thornton St. Estimated cost \$1,000,000

O., Middletown—Warren Paper Co., Middletown, has awarded the contract for a 1 story warehouse to McGraw Construction Co., Middletown. Estimated cost \$85,000

O., Toledo—Libbey-Owens-Ford Glass Co., East Broadway, has awarded the contract for the construction of an addition to its safety glass plant to A. Bentley & Sons Co., 301 Belmont St. Estimated cost \$250,000

Pa., Chester—Scott Paper Co., foot of Market St., has awarded the contract for Bldg. No. 17 to David M. Hunt, 1709 Sansome St., Philadelphia. Estimated cost \$400,000

Pa., Lancaster—Armstrong Cork Co., Liberty & Charlotte Sts., has awarded the contract for a research laboratory and pilot plant to Henry E. Batton, Inc., 1717 Sansome St., Philadelphia. Estimated cost \$1,500,000

Pa., Philadelphia—Atlantic Refining Co., 260 South Broad St., has awarded the contract for a 4 and 4 story laboratory and machine shop to Lauter Construction Co., 112 South 16th St. Estimated cost \$600,000

S. C., Camden—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., will construct the second unit of a 250x1,000 ft. "Orlon" yarn plant here. Work will be done with own forces. Estimated cost will exceed \$2,500,000

Tex., Pasadena—Industrial Materials, Inc., Pasadena, will enlarge its cement batching plant. Work will be done purchase and hire and subcontracts. Estimated cost \$75,000

Tex., Texas City—Pan-American Refining Corp., has awarded the contract for a compressor station unit to Thos. Bryan & Associates, M & M Bldg., Houston. Estimated cost \$145,000

W. Va., Clarksburg—Eagle Convex Glass Co., Clarksburg, has awarded the contract for additions to its factory to Jarvis Courtney, 410 Ohio Ave. Estimated cost \$100,000

Wis., Superior—Huron Cement Co., Detroit, Mich., has awarded the contract for a cement grinding plant and silo storage to Roland C. Buck, Inc., 1225 Tower Ave., Superior. Estimated cost \$175,000

Que., Drummondville—Canadian Celanese, Ltd., Drummondville, has awarded the contract for a 1 story warehouse to G. Laferte, 314 St. John St. Estimated cost \$120,000

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and Chemical Testing!**

**W**ANT TO KNOW COSTS of a process before full-scale production? Need laboratory engineering information that will guide you in designing a more efficient plant?

To help answer vital questions such as these, a new booklet—the picture story of the Basic Industries Research Laboratory—defines the types of research available, contains a record of investigations plus an important section about costs and a complete description of the testing equipment available.

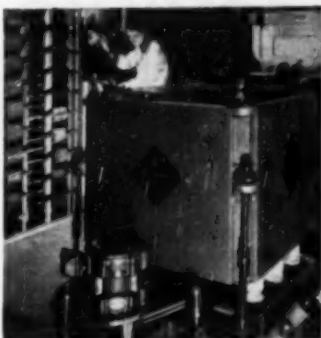
Typical pictures shown here are of testing facilities for food, chemical and grain processing operations.

Some 90% of the test work conducted in this section of the Laboratory covers such products as nut shells, scrap leather, sisal fiber, dehydrated soaps, malted milk, sugar, salt, coffee, beans, seed, coal and other materials. Here, profitable solutions to problems of scrap and waste utilization are being discovered and made available.

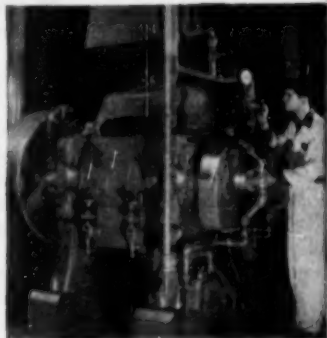
If you are engaged in or associated with the basic industries processes, we would be most happy to send you a copy of this valuable booklet. Write your nearest Allis-Chalmers district office.



Batch processing laboratory contains facilities for small scale tests.



Commercial size gyratory sifter for special tests. Note also experimental corrugated and smooth rolls for batch roller mill tests.



Rolls on this full size flaking mill may be steam heated or refrigerated to meet requirements of various flaking tests.

**FREE! Send Today**



New 32-page booklet pictures extensive testing facilities available — facilities which may help solve your processing problems!

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MILWAUKEE, WIS.

Please send new Laboratory  
Bulletin 07864198.

Name \_\_\_\_\_

Company \_\_\_\_\_

Position \_\_\_\_\_

Address \_\_\_\_\_

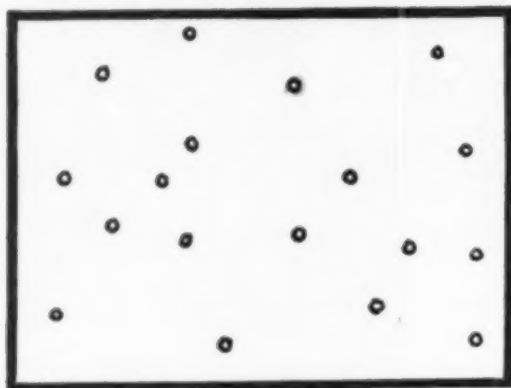
A-1094

## ALLIS-CHALMERS

Basic Industries Research Laboratory — Dedicated  
to a Better Utilization of our Raw Materials



# It isn't as easy as it looks... solving this puzzle



In the diagram at the left, draw six lines across the rectangle in such a way as to separate each small circle from every other circle. LOOK FOR THE SOLUTION WHICH WILL APPEAR NEXT MONTH. (Par—15 min.)

## or solving your DRYING PROBLEM...

Often it is only after you tackle a puzzle that you begin to uncover the unexpected little twists that show it isn't as easy as it looks. In this respect, drying problems are somewhat like puzzles... the chief difference is that in tackling a puzzle you have nothing to lose but time as you unscramble its complexities. As you deal with a drying problem you not only find that you are spending time and money—but your ultimate solution may seriously affect your entire processing operation. That is why it pays to regard the basic approach to the solution of a drying problem so seriously.

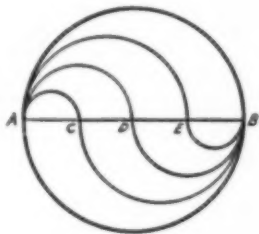
There are two things to keep in mind to help speed the proper solution to your drying problem. First—early consideration of your drying system is imperative. Second—seeking the assistance of qualified Proctor drying engineers at this early stage may save hours of time and hundreds of dollars. More and more manufacturers are finding this out for themselves. Proctor engineers, working in close cooperation with your technicians, who know your individual product's characteristics, make an almost unbeatable combination.

Early consideration of your drying problem with Proctor engineers always results in preliminary and subsequent equipment being properly dovetailed to drying and this is extremely important to plant efficiency.

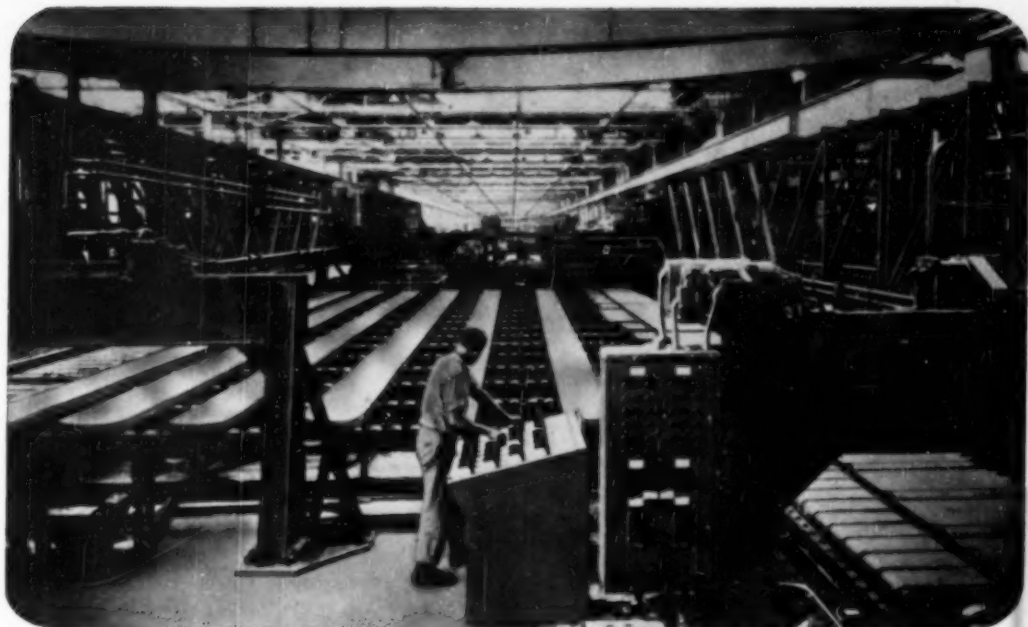
The facilities of Proctor research laboratories are available to you without cost or obligation. Those who have availed themselves of these facilities, have found that it has always worked out to their advantage.

Call or write today regarding your drying equipment needs.

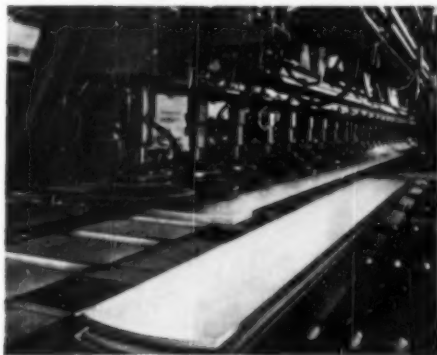
The problem was—divide this circle into four equal parts by drawing three curved lines of equal length.



**PROCTOR & SCHWARTZ** INC • 711 TABOR ROAD • PHILADELPHIA 20 • PA •



## T O BUILD OR NOT TO BUILD



The smaller illustration is of the vacuum cup handling equipment operating in conjunction with the 2-Hi Cold Rolling Mill. Because of the massive size and weight of individual brass bars, all handling is mechanical.

This Mill, designed and constructed by Stone & Webster Engineering Corporation, is capable of producing the heaviest non-welded coils of strip brass, and includes the largest cold breaking-down mill in America.

For Scovill Manufacturing Company, Stone & Webster Engineering Corporation carried on continuing studies of the client's production operations over a period of four years. Analysis was made of production pattern for anticipated requirements, with costs of production in proposed mills compared with costs in the existing plant.

Companies today, faced with improving production facilities or lowering cost of plant operation, find comprehensive engineering reports by Stone & Webster Engineering Corporation valuable in developing sound, long range production plans.



**STONE & WEBSTER ENGINEERING CORPORATION**

A SUBSIDIARY OF STONE & WEBSTER, INC.

SEND FOR THIS



*This new bulletin contains useful information such as specifications, physical and chemical properties, and solubility and compatibility data for Barrett® "ELASTEX" Plasticizers and Dibutyl Phthalate:*

*"ELASTEX" 28-P Plasticizer (Diethyl Phthalate)*

*"ELASTEX" 10-P Plasticizer (Diiso-octyl Phthalate)*

*"ELASTEX" DCHP Plasticizer (Dicyclohexyl Phthalate)*

*"ELASTEX" 50-B Plasticizer (Butyl Cyclohexyl Phthalate)*

*Dibutyl Phthalate*

*A copy will be sent you on request.*

\*Reg. U. S. Pat. Off.



**THE BARRETT DIVISION**

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N.Y.

In Canada: The Barrett Company, Ltd.

5551 St. Hubert Street, Montreal, Que.

# U.S.I. CHEMICAL NEWS

June

★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries

★ 1950

## Hydrocarbon Synthesis Source of Acetaldehyde And Propionaldehyde

### Compounds Are Important Raw Materials for Syntheses

The hydrocarbon synthesis will soon provide a new source of two members of the chemically active aldehyde series, acetaldehyde and propionaldehyde. These compounds are important intermediates in countless chemical syntheses. The two aldehydes will be available from U.S.I. shortly after plant operations are initiated.

An extremely volatile, colorless liquid with a strong, penetrating odor, acetaldehyde is widely used as a chemical raw material in the production of other organic chemicals. It is used in the manufacture of pentaerythritol, a polyhydric alcohol important in the production of alkyl resins, and in making the resin, polyvinyl acetal.

Currently, the largest use of acetaldehyde is to produce acetic acid by catalytic oxidation. The U.S.I. acetaldehyde to come from the synthesis will be carefully separated from a water solution and subsequently purified to meet rigid quality specifications.

Propionaldehyde has physical properties between those of acetaldehyde and butyraldehyde. The reactivity of the aldehyde group and the ready replacement of the alpha hydrogen makes it of wide use in chemical syn-

**MORE**

## Wetting, Penetration Of Surface-Active Agents Measured by New Method

A new method has reportedly been devised to determine comparative wetting and penetration qualities of surface-active agents. The new technique involves adding a definite volume of surface-active agent solution to the most porous of a series of five stainless steel filtering crucibles having sintered, stainless steel filtering elements of varying porosities. A record is made of the time in seconds required to deliver the first drop and the first milliliter of solution. Based on the time for delivery under each category, a rating is given and the comparative wetting and penetration of each surface-active agent studied are evaluated, according to the scientists who developed the new technique.

The same method is said to be applicable for copper, bronze, medium steel, glass, canvas, cloth, and other textile materials; it reportedly can also be used in research on metal cleaning problems.

## New Book on Safe Handling Of Radioactive Isotopes

A new 30-page booklet on safe handling of radioactive isotopes, conveniently subdivided for ready reference, is said to include tabulations of properties of the principal isotopes.

## U.S.I. Launches 1950 Program For Truck-Crop Insect Control

### On-the-Job Tests in 1949 Proved U.S.I.'s CPR Dust Base Is Faster, More Versatile, Longer Lasting than Rotenone

In 1949 American truck farmers, who use over a billion pounds of insecticides each year, found a new, powerful ally in their war against crop insects — U.S.I.'s CPR Dust Base. This combination of piperonyl cyclonene, pyrethrins,

and rotenone was thoroughly field-proved last year and test results show that CPR:

1. Proved effective against a wide variety of insects, including certain destructive insects

### Two New Free Booklets on Farm Insect Control

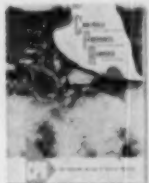
Tips on economical insect control — on the dairy farm and on the truck farm — are contained in two new free booklets available now from U.S.I. "Controlling Insects on the Dairy Farm" presents important data on Pyrethroids

and includes frank discussions of: the dollar side of insect control; choosing an insecticide; how to apply insecticides; how to avoid toxic hazards and contamination of milk; and effectiveness and range of control.

The new, informative booklet on truck-



crop insect control, "CPR," presents data on the impressive results achieved in actual on-the-job tests of CPR conducted during 1949. It also contains important information on just what insects CPR controls and how CPR prevents the hazard of toxic residues. For free copies, write the Editor, U.S.I. Chemical News.



\*Reg. U.S. Pat. Off.



In 1949, their first season of commercial use, CPR-based insecticides proved they have the versatility needed for all-around, all-season truck-crop insect control.

against which rotenone alone is not too effective, such as the green clover worm, the diamond back moth and the imported cabbage worm;

2. Demonstrated a killing potency six times faster than rotenone itself, with CPR effecting a kill in 12 hours and rotenone in 72 hours against the same insects;

3. Indicated a more effective residual power, with CPR lasting from 5 to 6 days, and rotenone from 2 to 3 days, under field conditions.

### Prevents Toxic-Residue Hazards

CPR Dust Base was introduced by U. S. Industrial Chemicals because of the apparent need of an insecticide that combined low toxicity with effectiveness. Growers can use CPR-based insecticides right up to and during harvest. No special processes are needed to remove deposits from CPR-treated crops. The washings ordinarily given to fresh vegetables before canning or packing are sufficient, because CPR leaves no toxic residues.

### Nation-wide Tests

Last year's investigations of CPR dusts had the cooperation of 31 federal and state-supported institutions and 15 actual or potential customers in tests on insects destructive to small fruits, vegetable crops, and ornamentals.

**MORE**

## Methionine-Supplemented Soybean Meal Is Found Equivalent to Egg Protein

Recent work at a leading eastern university has shown that the protein of soybean meal has a biological value equal to that of whole egg protein when supplemented with methionine. The addition of approximately 0.2 percent methionine to soybean meal resulted in a protein which was retained as effectively by the animal as whole egg protein. The addition of whole egg to the ration containing soybean meal and methionine did not further enhance the value of the protein in the experimental rations. The work was carried out on hogs using a diet made up of 10% protein derived entirely from soybean meal.



June

★

# U.S.I. CHEMICAL NEWS

★ 1950

## CONTINUED Insect Control

The dust was used in practically all sections of the country, both commercially and experimentally, throughout the year. The positive results against a wide range of insect life are sufficiently conclusive to regard CPR Dust Base Materials as an ideal general purpose insecticides for use in the vegetable, small fruit, and ornamental field.

CPR-based insecticides were shown to be particularly outstanding against the principal



This is what happens to healthy bean plants when Mexican bean beetles move in. Once an infestation reaches the pupae stage shown above, the damage is done. A treatment with CPR when beetles first appeared could have prevented it.

insects affecting beans, including the Mexican bean beetle, the bean leaf beetle, the green clover worm and bean thrips—also against worms and loopers on cruciferous crops, flea beetles, blister beetles and many other leaf-eating insects. Other recommendations for CPR formulations, made possible by reported observations, include onion thrips, corn-ear worm, diamond back moth, melon worm, pickle worm, squash vine borer, omnivorous leaf tier, lygus campestris, asparagus beetle, webworm, and boxelder bug, the latter an ornamental pest.

## Uses Superheated Steam In Spray Painting

Recent research experiments indicate use of superheated steam in spray painting instead of compressed air has these advantages: one pass application for 2 mils of film, and increased efficiency (less overspray). Boiler employed in the experiments is described as self-regulating and free of flame or fire hazards and all low-water danger. It is said to have no coils or tubes to burn out, scale, or to need replacing.

## CONTINUED Aldehydes

thesis. Propionaldehyde condenses with itself to form an aldol which may be dehydrated and hydrogenated to yield 2-methyl pentanol, a hexyl alcohol of promise in the manufacture of plasticizers. With formaldehyde, propionaldehyde condenses to form pentaglycerol, a trihydroxy alcohol superior to glycerine and pentaerythritol for some uses. Polyvinyl propional resins have properties similar to polyvinyl acetal but better adapted to some applications.

Propionaldehyde may be used to modify thermosetting resins for which other aldehydes are raw materials. It may be oxidized to propionic acid or hydrogenated to n-propyl alcohol. Condensation with amines produces rubber accelerators. Reactivity of the material makes possible the synthesis of materials of interest to the pharmaceutical industry.

### Specifications

Propionaldehyde Content by wt. . . .	96.0% min.
Specific Gravity 20°/20°C. (in air) . . .	0.803 to 0.809
Color (ASTM D-260) . . . . .	Water White
Acidity, % by wt. on propionic . . . . .	0.5% max.
Distillation Range . . . . .	4°C., last. 47.9
Non-volatile matter, gm/100 cc., . . . .	
Max. . . . .	0.003
Heavy Metals, % by wt., Max. . . . .	0.003
(Calc. as iron) . . . . .	
Odor . . . . .	Characteristic

## TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

**A new-type container for packaging** talcums, deodorants, medicinal and household creams and waxes, reportedly combine features of the collapsible tube and the "hard-covered" container. A twist of the bottom of the container is said to force ingredients up and out, leaving the cylinder intact. Tube may be readily emptied and exact amounts required can be delivered each time, the makers state. (No. 589)

**An electric motor run continuously on a small flashlight battery.** 1 1/8" high by 1 1/8" wide, has a speed of approximately 10,000 rpm on a 3-volt battery, the manufacturers claim. (No. 579)

**A new washable non-skid floor coating** for walk-in deep-freezers and refrigerators, slaughter houses, hotel kitchens, and hospitals, is said to be unaffected by fruit juices, butter, milk, and blood. (No. 571)

**To restrain oxidation of soaps and resulting rancidity and discoloration,** an amino compound which can be employed in either soda or potash soaps is available. It is said not to impart odor or color to soaps or to affect their efficiencies. (No. 573)

**To simplify spray painting and permit control of "spray pattern"** width from slightly more than an inch to over 12 inches, a new spray gun with a controllable nozzle and 4-finger trigger is on the market. (No. 575)

**An automatic pipette** for safe, accurate, convenient dispensing of liquids used routinely in small quantities, will handle volumes up to 2.0 ml., it is claimed. An adept operator can use the pipette 20 to 30 times per minute, according to the makers. (No. 574)

**A new stopper and unloading device** for emergency use on tank cars, said to stop wild flow as soon as it is put in place, permits unloading of contents without necessity of unloading overhead. (No. 572)

**An aluminum foil-backed wrapping paper** for vaportight packaging of new and spare parts is described as waterproof, scuffproof, and resistant to oils, greases, mild alkalis and acids. (No. 576)

**For imparting fire-retardant properties** to all types of cellulose fabrics, a new low-cost chemical composition is reported available. (No. 577)

**Viscosity measurements directly in centrifuge** units without need for calculations are reported possible with a new instrument providing highly reproducible results, having unusual sensitivity over its full range, simple to operate, and applicable for any liquid of the free-flowing, Newtonian type. (No. 578)

## PRODUCTS OF U.S.I.

### ALCOHOLS

Amyl Alcohol (Isomyl Alcohol)  
Butanol (Normal-Butyl Alcohol)  
Pentyl Oil—Refined  
Propanol (Normal-Propyl Alcohol)

### Ethanol (Ethyl Alcohol)

Specialty Denatured—all regular and anhydrous formulas  
Completely Denatured—all regular and anhydrous formulas  
Pure—190 proof U.S.P.  
Absolute—200 Proof  
Selen—granular solvent—regular and anhydrous

### ANTI-FREEZES

Super Pym® Anti-Freeze  
U.S.I. Permanent Anti-Freeze

### ANISOLS

Anisol® RI  
Anisol® PI

### ACETIC ESTERS

Amyl Acetate—Commercial and High Test

Butyl Acetate  
Ethyl Acetate—all grades  
Normal-Propyl Acetate

### OXALIC ESTERS

Dibutyl Oxalate  
Diethyl Oxalate  
Dipropyl Oxalate

### PHthalic ESTERS

Diamyl Phthalate  
Dibutyl Phthalate  
Diethyl Phthalate  
Dipropyl Phthalate

### OTHER ESTERS

Dibutyl Carbonate  
Diethyl Chloroformate

### INTERMEDIATES

Acetoacetonitrile  
Acetoacet-artha-chloroanilide  
Acetoacet-artha-toluidide  
Acetoacet-pure-chloroanilide

Ethyl Acetoacetate  
Ethyl Benzoylacetoate  
Ethyl Sodium Oxalacetate

### ETHERS

Ethyl Ether, U.S.P.  
Ethyl Ether, Absolute—A.C.S.

### ACETONE—A.C.S.

### FEED PRODUCTS

Choline Concentrates  
Curbay B-Q  
C. dehydrated  
Riboflavin Concentrate  
Special Liquid Curbay®  
U.S.I. Animal Protein Factor Supplement  
Vaccines—40

### RESINS (Synthetic and Natural)

Aroclor®—modified types  
Aroclor®—pure phenolics  
Aroclor®—for special flat finishes

Aroplast®—alkyds and allied materials  
Cango Gum—resin, fused & esterified  
Ester Gums—all types  
Natural Resins—all standard grades

### INSECTICIDE MATERIALS

CPR Concentrates: Liquid & Dust  
Piperonyl Butoxide  
Piperonyl Cyclonene  
Pyrethane® Concentrates: Liquid & Dust  
Pyrethrum Products: Liquid & Dust  
Rhenane Products: Liquid & Dust

### INSECTICIDE MATERIALS

Indalone®

Triple-Mix Repellents

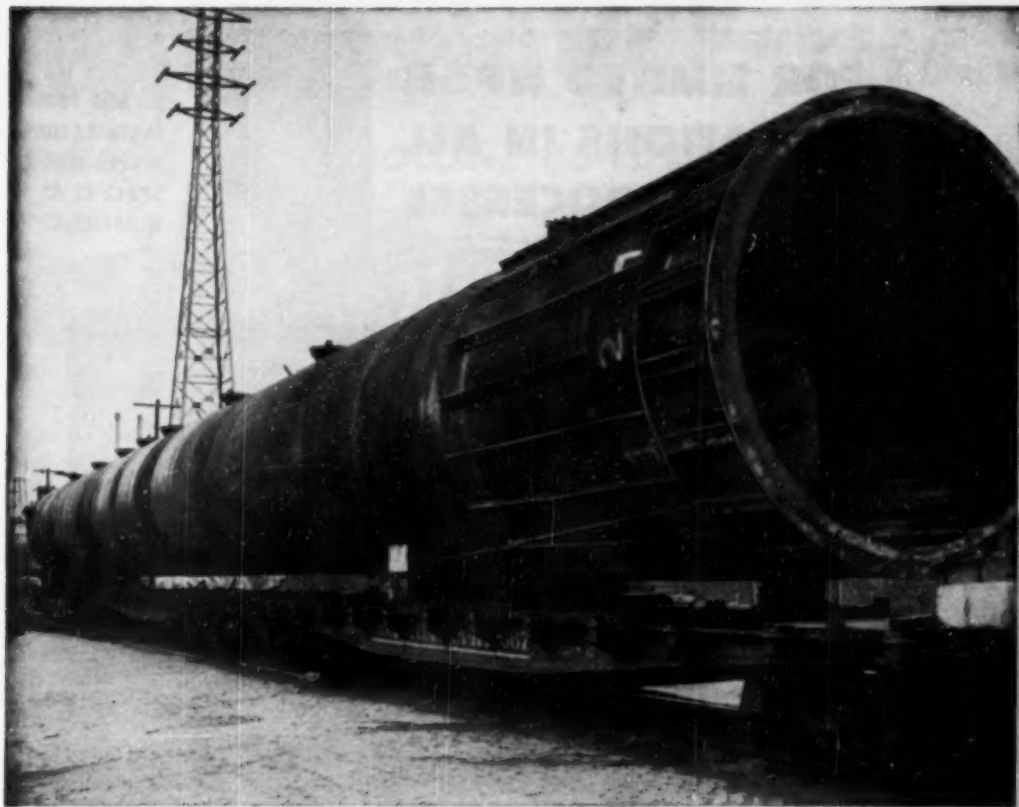
### OTHER PRODUCTS

Cellulose  
Ethylene  
Nitrocellulose Solutions  
P/B®—Liquid Insulation  
Urethane, U.S.P.  
Special Chemicals and Solvents

# U.S.I. INDUSTRIAL CHEMICALS, INC.

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BRANCHES IN ALL PRINCIPAL CITIES



# BIG business

Making an item like this is a job for a big plant—one with a set-up and experience in building important units. It's big business any way you look at it, and Sun Ship, with its vast facilities, experience and know-how, is the outfit able to handle it . . .

The 11' x 139' Deisobutanizer Column pictured above is a sample of the Sun-built refinery and chemical plant equipment that has made the name Sun Ship as famous on land as the Sun-built tankers and cargo ships that ply the seven seas.

## Sun

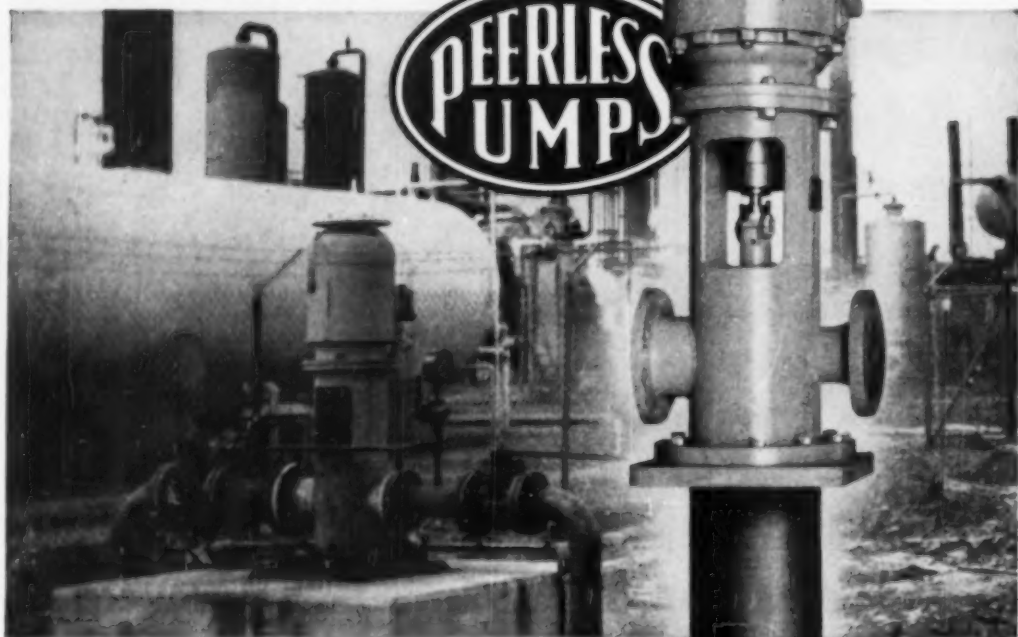
**SHIPBUILDING & DRY DOCK COMPANY**

SINCE 1916

ON THE DELAWARE • CHESTER, PA.  
25 BROADWAY • NEW YORK CITY

# FOR LIMITED NPSH APPLICATIONS IN ALL INDUSTRIAL PROCESSES

...AND FOR  
INSTALLATIONS  
WHERE FLOOR  
SPACE IS AT  
A PREMIUM



## THE *Peerless* HYDRO-LINE

ENCASED CLOSE-COUPLED VERTICAL CENTRIFUGAL PUMP

**For application to:** Petroleum Refinery Techniques • Line Booster Service • Chemical Processing • Condensate Return Service.

**Especially suited for Pumping:** Hydrocarbons, such as: Gasoline, Propane, Butane, Oils, etc. • Hot or Cold Water • Acids • Bases • Salt Solutions—Mild or concentrated at temperatures from normal to 400° F.

This successful modification of the Peerless vertical, close-coupled turbine pump, for industrial processes embodies all the exacting design, construction and performance characteristics which have made Peerless the sales leader in the field of vertical turbine pumps. The Peerless Hydro-Line is easy to under-

stand, install, operate and maintain. It has been especially designed for limited space requirements and for limited NPSH applications. Request your copy of Peerless Bulletin B-592 for full details of Hydro-Line design, construction, application and performance.



### PEERLESS PUMP DIVISION FOOD MACHINERY AND CHEMICAL CORPORATION

Factories: Los Angeles, California, and Indianapolis, Indiana.  
Offices: New York, Atlanta, Chicago, St. Louis, Phoenix, Fresno, Los Angeles, Dallas, Plainview and Lubbock, Texas.

#### CHARACTERISTICS AT A GLANCE:

##### CAPACITIES

Up to 5000 GPM.

##### HEADS

Up to 1500 feet.

##### DRIVER

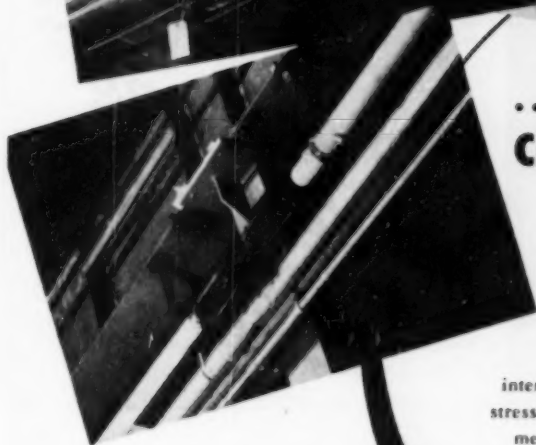
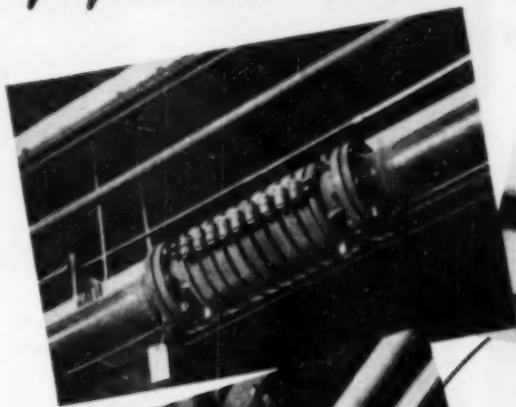
As required; standard vertical, solid shaft, hollow shaft, or explosion-proof motors; steam turbine.

##### MATERIALS

Cast iron bowls, bronze impellers, 316 stainless steel shaft, standard; any special materials can be furnished on order to suit the individual need.

# MAINTENANCE-FREE

*pipe line motion control is yours*



## ...with CMH EXPANSION JOINTS

There's no longer any need to spend time and money on periodical maintenance of expansion joints. You can install CMH corrugated expansion joints and forget them . . . there's no packing to pull up or replace. In CMH expansion joints, the curvature of corrugations serves to minimize internal stresses and to provide balance of working stresses. This design coupled with advanced forming methods developed through years of research and experience assures long, trouble-free service.

For a new installation or for replacement of obsolete equipment, specify CMH expansion joints for the practical, dependable answer to control of axial, lateral or radial motion in piping.

*The illustrations show three typical installations of CMH Controlled-Flexing Expansion Joints.*

### A CMH TYPE to meet every need

CMH EXPANSION JOINTS are made as Free-Flexing for pressures up to 30 psi, Controlled-Flexing for pressures up to 300 psi, and Flexoniflex for pressures up to 1500 psi, temperatures to 1600° F. Sizes range from 1/2" to 30" I. D. and larger. Available in copper, stainless steel or other alloys with flanged or welding ends.

Flexon identifies CMH products that have served industry for over 48 years.



## CHICAGO METAL HOSE Corporation

1317 S. Third Avenue • Maywood, Illinois • Plants at Maywood, Elgin and Rock Falls, Ill.  
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

# CMH

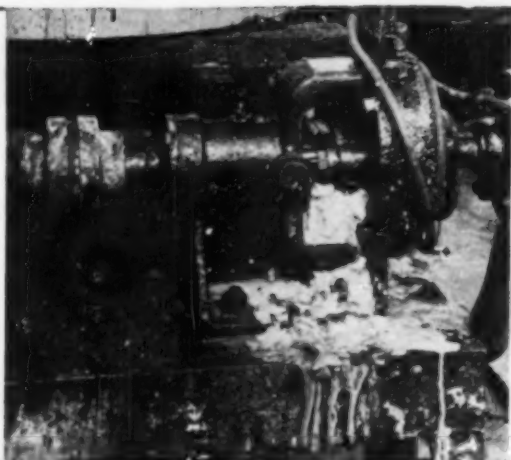
### ONE DEPENDABLE SOURCE for every flexible metal hose requirement

Corrugated and Controlled Flexible Metal Hoses in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduits and Arrows • Accessories of These Components

*They're  
pumping the  
same liquid...*

**WHERE CONVENTIONAL PUMP PACKING WASTES** ➡

Here are two pumps handling fatty acids. The one on the right with conventional packing is wasting money because of lost process liquid, and time lost in cleaning and maintenance. This leakage could, on corrosive liquids, be hazardous.



← **THE WORTHINGTON MECHANICAL SEAL SAVES**

The pump on the left is neat and clean, due to the use of a Worthington Mechanical Seal on the stuffing box.



*but only one  
is delivering  
all of it!*

While conventional packing is fully adequate in most pumping jobs, there are many cases, in the chemical industry particularly, where a Worthington Mechanical Seal will result in much more efficient and economical pumping performance.

**Real Result-Getters**

It is a fact that Worthington Seals have achieved yearly savings of up to \$500 per pump — by eliminating loss or contamination of the liquid and by greatly re-

ducing maintenance costs. They may be your own best bet for better, lower-cost pumping.

For further facts on Worthington Mechanical Seals and proof that *there's more*

worth in Worthington, write for bulletin W-350-B10, Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.



**WORTHINGTON**



**THE WORLD'S  
BROADEST LINE  
ASSURES YOU THE  
RIGHT PUMP FOR  
EVERY JOB**



**Type CG and CGL.** Sizes ½" to 10". Capacities to 3000 GPM; heads to 200 ft. Liquid ends of WORTHITE alloy.



**Type CF.** Sizes 1" to 4". Capacities to 1000 GPM; heads to 130 ft. Standard, all iron and all bronzes.



**Type CQ.** Sizes 1½" to 3". Capacities to 600 GPM; heads to 130 ft. at 1750 RPM. Closed impeller. WORTHITE shaft and fittings.



**Type L.** Sizes 3" to 8". Capacities to 2250 GPM; heads to 300 ft. Single stage volume. For general service.

CO-4



# Penberthy Ejectors

(ASPIRATORS, EDUCTORS, EXHAUSTERS, MIXERS, ETC.)

*Have Many Advantageous Uses in  
the Chemical and Process Industries*



A simple jet pump operated by steam, water or air, the Penberthy Ejector has no moving parts and requires no lubrication. It is very unlikely to get out of order and wear is not appreciable. Other advantages of this jet type pump are that it is practically noiseless, very reliable, compact, convenient and has low initial cost.

Widely used in the chemical and process industries, Penberthy Ejectors are made from  $\frac{1}{2}$ " to 6" pipe sizes with screwed or flanged connections. They are made in bronze, iron and a wide variety of materials that successfully withstand corrosion, contamination and high temperatures. Special units are designed and manufactured to meet unusual conditions. Your inquiries are solicited. Write for Catalog 34.

## PENBERTHY WATER HEATER



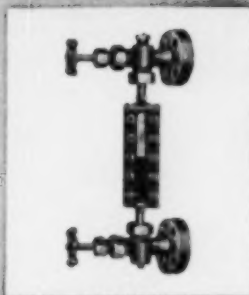
Penberthy XL-32 Water Heater (Open Tank Type) uses steam to heat water or other liquids to any temperature up to boiling (212° F) . . . quietly and without surging or pounding. Operating steam pressures range from 3 to 140 psi at the heater nozzle. Made of high grade bronze. Sizes are from  $\frac{1}{2}$ " to 2". Write us regarding special heaters for unusual conditions.

3949

## PENBERTHY

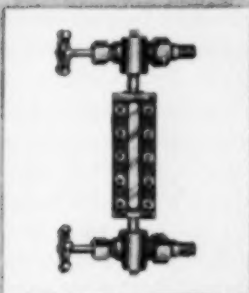
REFLEX and  
TRANSPARENT

Liquid Level Gages



### REFLEX

Due to "Reflex" principle, liquid always shows black and empty space white. Liquid level is indicated instantly and unmistakably. Made in any length desired of temperature resisting alloy steel for high pressure and temperature service. Conforms with API and ASME requirements. Ask for new Catalog 35.



### TRANSPARENT

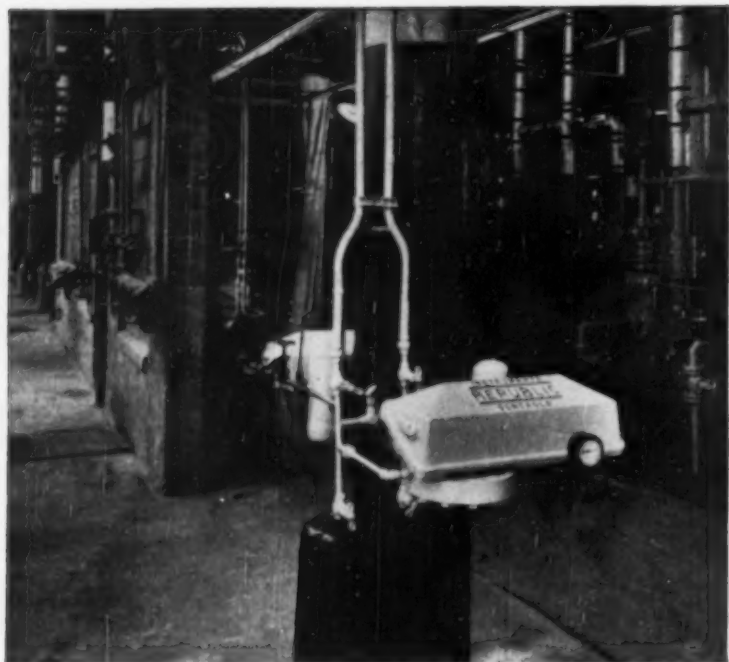
Glass front and rear permits observation of color and density of liquids under high pressures and/or temperatures. Highest quality—made of temperature resisting alloy steel in any length required. Conforms with API and ASME requirements. Ask for new Catalog 35.

**PENBERTHY INJECTOR COMPANY**  
DETROIT 2, MICHIGAN

Established 1896

Canadian Plant, Windsor, Ontario





## **These Meters Had To Be ACCURATE — FLEXIBLE — RUGGED**

One hundred twenty one Republic Pneumatic Transmitters are measuring the flow and level of various acids in a large chemical processing plant, a section of which is pictured above.

These transmitters have a guaranteed accuracy of within  $\frac{1}{2}$  of 1% of the transmitter range. By making a few minor adjustments or substituting a few small parts, their operation can be easily changed to any desired range between a minimum of 0—0.6" of water to a maximum of 0—704" of water. Their construction is more like that of a precision machine than of the sensitive instrument they are. It is for these reasons that Republic Pneumatic Transmitters, even though comparatively new, have already

been specified and installed on over 2500 industrial metering applications.

Republic Pneumatic Transmitters are available for measuring flow, liquid level, pressure or liquid density of a wide range of fluids. They employ the force-balance principle to convert these process variables into air pressures which vary proportionally. These air pressures become direct measurements and can be conducted to reading instruments or used as the measuring impulse for the actuation of an automatic controller.

Data Book No. 1001 contains complete details on the construction and operation of Republic Transmitters. Write for your copy today.

**REPUBLIC FLOW METERS CO.**

2240 Diversey Parkway, Chicago 47, Illinois



## ...easier and better the WeldELL way

For the *practical* facts about pipe welding fittings go to the *practical* men...the welding foreman; the pipe fitter foreman; the construction superintendent... who have used all kinds and know the field.

They will tell you that the job moves faster and costs stay down when WeldELLS and other Taylor Forge fittings are used

...because of the precision quarter markings, the sized end tangents, the accurate machine tool bevels and lands.

They will tell you that the job maintains momentum easier, smoother

...because of the completeness of the line and better identification markings.

They can tell you...at least, design men will...that the *finished* job is better

...because it is done with fittings that are engineered down to the last detail to meet all requirements of *every* job.

Yes, "WeldELLS have everything"...to make it *easier*...*better*. Coupon brings lots of facts.

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TAYLOR FORGE & PIPE WORKS • General Office & Works: Chicago 90, Ill. (P.O. Box 485); Eastern Plant: Carnegie, Pa. Western Plant: Fontana, Calif. District Offices: New York: 50 Church Street. Philadelphia: Broad Street Station Bldg. Pittsburgh: First National Bank Bldg. Chicago District Sales: 208 S. LaSalle Street. Houston: City National Bank Bldg. Los Angeles: Subway Terminal Bldg. San Francisco: Russ Bldg.

Please send a copy of your new welding fittings and forged steel flange catalog 484

Name

Position

Company

Street Address

City  Zone  State

Mail to Taylor Forge & Pipe Works

P.O. Box 485, Chicago 90, Ill.

513-0650

# Which SEPARATION PROBLEM RESEMBLES

# Yours?

Acid Sludge • Blood • Caustic Soda • Chicla  
 Citrus Juices • Cooking Fat • Essential Oils  
 Fire Extinguisher Fluid • Fish Oil • Formaldehyde  
 Glue Liquor • Gluten • Irish Moss • Lacquer  
 Latex • Liver Oil • Olive Oil • Paint & Varnish  
 Penicillin • Pharmaceuticals • Printing Ink  
 Proteins • Serum • Starch • Streptomycin  
 Tomato Juice • Vegetable Oil • Wool Grease • Yeast



## *I can speed up your process, too*

"I am De Laval Centrifugal Force. I have made many processes more profitable by making the separation or clarification step continuous. When centrifugal force can be used to replace slower, obsolete methods of separating two liquids, or removing solids from a liquid, I speed up operation, save labor and cut production costs.

"Can I go to work for you? It might pay you to see —"

De Laval Centrifugal Force is applied through more than a dozen different types of centrifugal machines that make it possible to select exactly the right one for a given job.

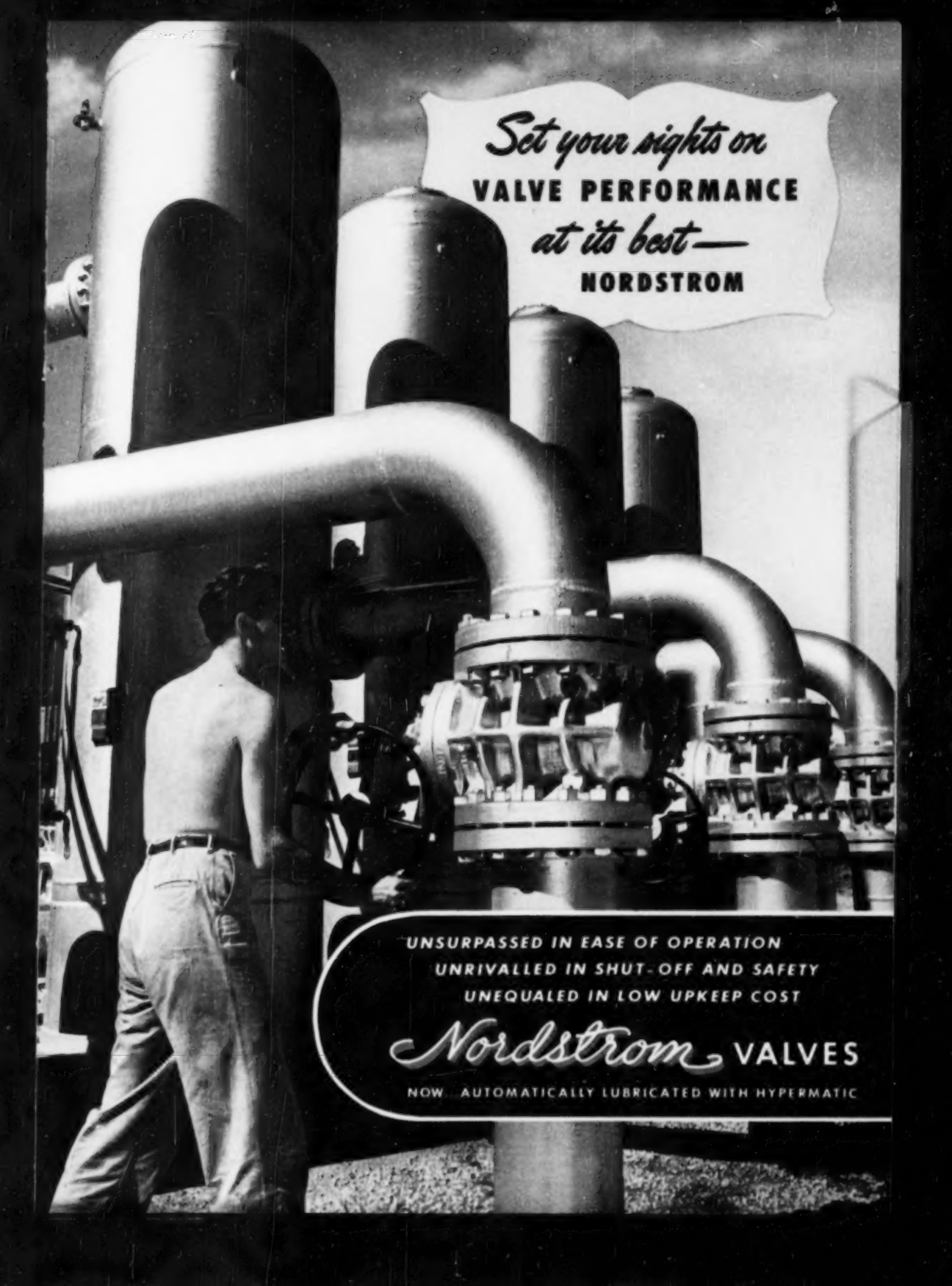
From the large "Nozzle-Matic" with a separating capacity of 6,000 gallons per hour or even more, to the smallest model suitable for Laboratory or Pilot Plant work, De Laval machines completely meet the need for centrifugal machines.



THE DE LAVAL SEPARATOR COMPANY  
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# De Laval Centrifugal Machines

## FOR PROCESSING SYSTEMS



*Set your sights on*  
**VALVE PERFORMANCE**  
*at its best—*  
**NORDSTROM**

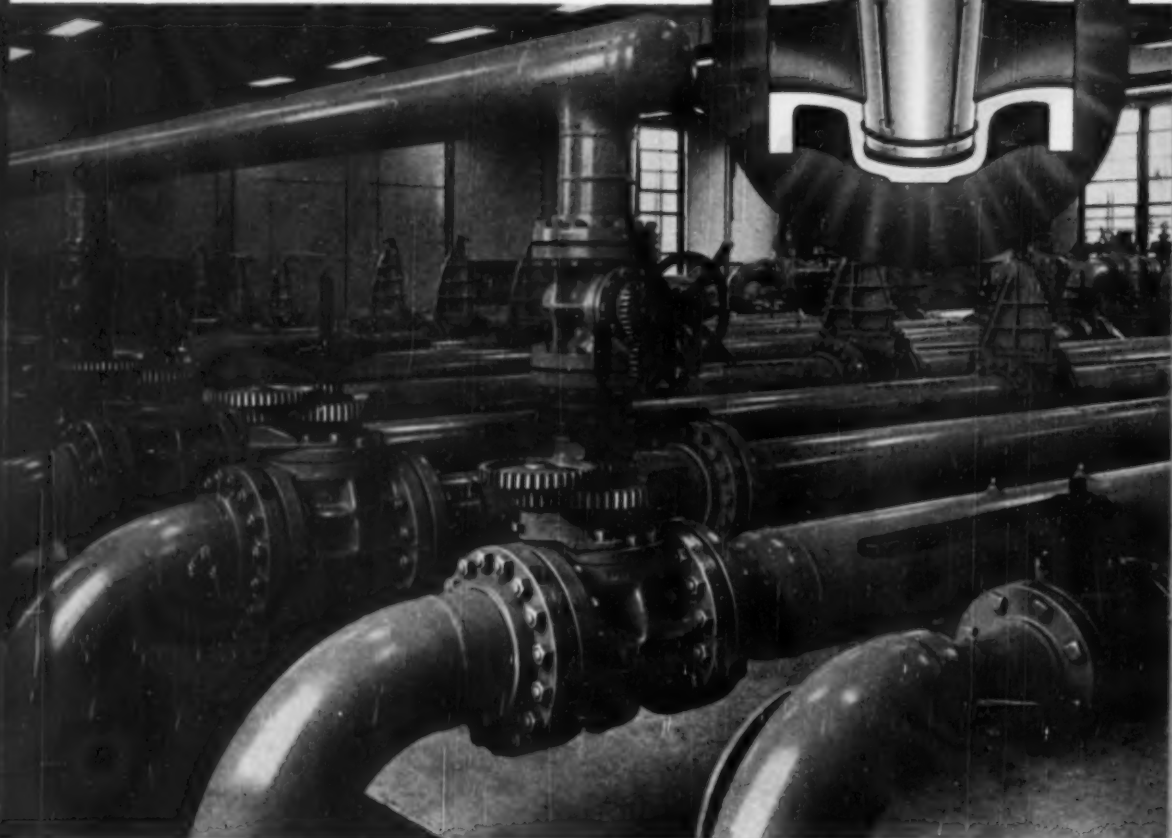
UNSURPASSED IN EASE OF OPERATION  
UNRIVALLED IN SHUT-OFF AND SAFETY  
UNEQUALED IN LOW UPKEEP COST

*Nordstrom* VALVES

NOW AUTOMATICALLY LUBRICATED WITH HYPERMATIC



THE SUREST WAY  
TO KEEP UPKEEP DOWN



*A typical installation of Nordstrom valves on gas lines in a terminal and distribution station.*

**20-year average** OF NORDSTROM PARTS REPLACEMENTS  
*less than 1/2 of 1% of valve purchases*

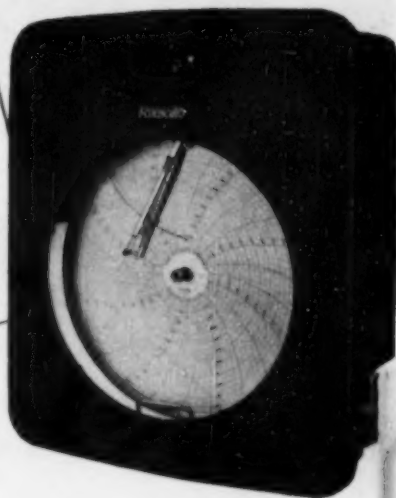
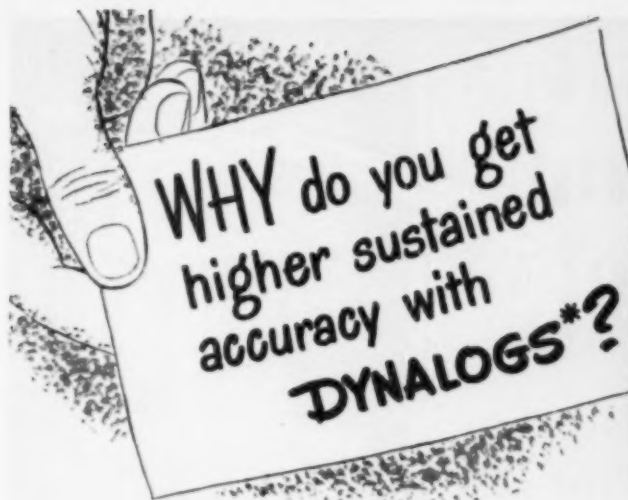
In a recent audit of sales of Nordstrom valves extending back over a period of 20 years it was found that the ratio of repair and replacement parts was less than 1/2 to 100. Replacement parts were principally for valves in highly erosive services and for high temperatures where drastic conditions prevail. In other words the repair parts have over a period

of 20 years equalled 46¢ to each \$100.00 worth of valves purchased. This is indicative of the amazing low cost of upkeep as compared with other types of valves requiring frequent renewal of seating parts, packings, stems and occasional re-welds. *Nordstrom repair parts over a period of years are about one-tenth cost as compared with other valves.*

**Nordstrom** VALVES



Nordstrom Valve Division  
**ROCKWELL MANUFACTURING CO.**  
400 N. Lexington Ave., Pittsburgh 8, Pa.  
*District offices in all principal cities*



**One reason is . . .  
they need no standardizing!**

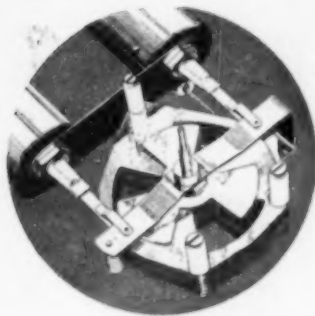
Your instrument men know that product quality suffers when measurement drifts between manual standardizing adjustments. They know, too, that even automatic standardizing allows accuracy to be lost when batteries discharge without being noticed. And if the process is on automatic control, standardizing of either kind "bumps" the process periodically.

You can eliminate these inaccuracies and inconveniences by putting Foxboro Dynalog Electronic Instruments on the job. They require no standardizing, use no batteries. They have only six moving

parts, none moving faster than the pen. Mechanical complications are eliminated, maintenance reduced to the vanishing point.

No standardizing is only one of many important advantages of Dynalog Instruments. Their unique design brings laboratory-standard performance to the measurement and control of temperature (with resistance bulbs or thermocouples), humidity, pressure, flow, force, pH, conductivity, etc. Their speed . . . full scale to new balance in as little as one second. Sensitivity . . . one ten-thousandth of scale. Accuracy . . .  $\frac{1}{4}$  of 1% of scale.

\*Reg. U. S. Pat. Off.



**Here's the heart of Dynalog superiority**

It's the simple variable capacitor that does it. Taking the place of the conventional slidewire, it gives Dynalog Instruments absolutely STEPLESS continuous balancing. It gives you an instrument of laboratory accuracy with a ruggedness that defies the most extreme industrial conditions. Get the complete story in Bulletin 427-1. Write The Foxboro Company, 16 Neponset Ave., Foxboro, Mass., U. S. A.

# FOXBORO DYNALOG

Reg. U.S. Pat. Off.

**The electronic potentiometer that has NO SLIDEWIRE**

# BAKER Platinum Laboratory Ware

*Tested by Use*

We have been manufacturing platinum laboratory ware for almost three quarters of a century and during that period have done much to bring this ware to its present exactness and high state of development. We introduced platinum-rhodium alloy laboratory ware, which is now so highly regarded, and such design changes as our reinforced rim crucibles and dishes and the Baker Low Form Crucible.

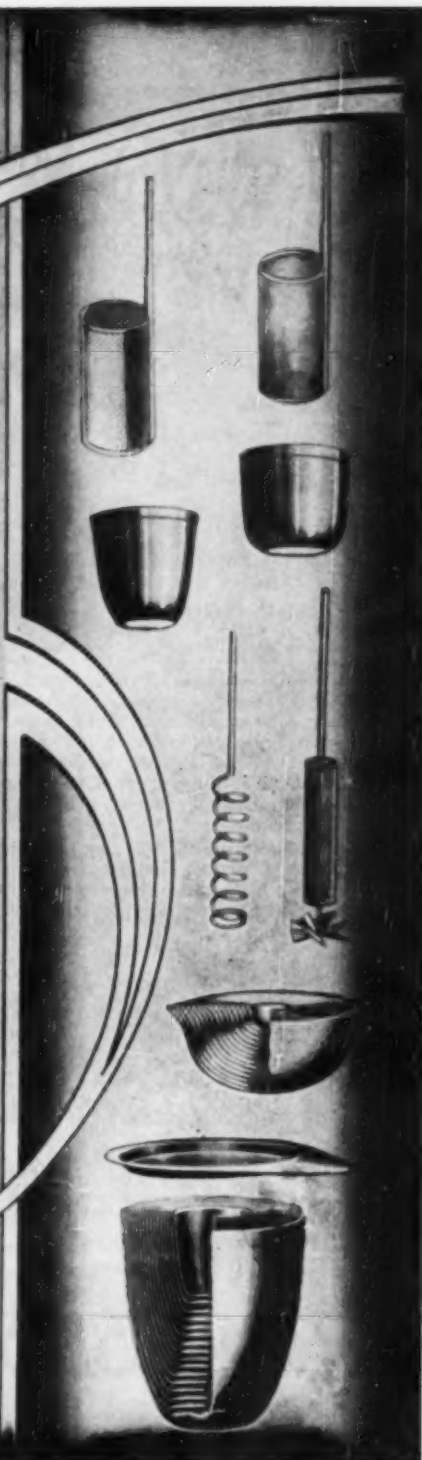
Because, naturally, our large scientific laboratories use apparatus manufactured by us in their own work, Baker Laboratory Ware is constantly subjected to continuous tests through use and so we are enabled to detect the need for improvements. An example was our observation of the tendency of stationary type electrodes to break at the junction of stem and cylinder, a fault which we overcame by reinforcing this joint.

Let us send you a copy of *Data Concerning Platinum*. It tells about our products and is a very valuable reference work too.

**BAKER & CO., INC.**

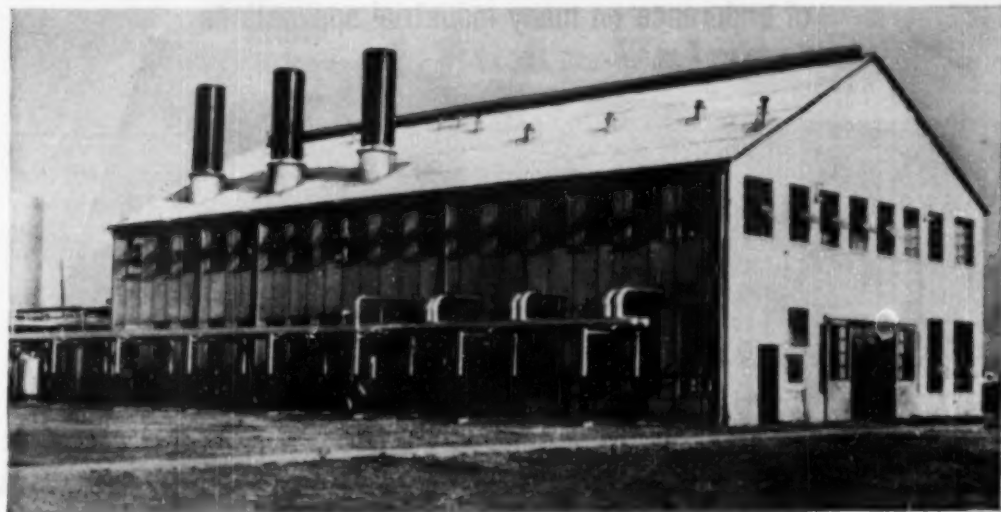
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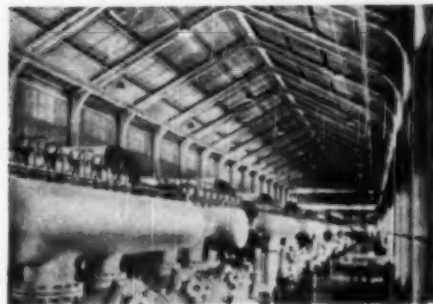


# CORRUGATED TRANSITE\* . . . for walls and roofs!

\*Transite is a registered Johns-Manville trade mark



**BETTER ROOFS AND SIDEWALLS . . . quicker, easier construction, too . . . that's part of the success story of these tough Corrugated Transite sheets that can't burn, can't rot, can't rust. And they're not expensive!**



On the inside, too, the Corrugated Transite walls and roof present a clean-cut, attractive appearance. They're maintenance-free and provide a high coefficient of light-reflection.

In these two recent examples, J-M Corrugated Transite on roofs and walls is doing the fundamental, rugged kind of job that first brought it to the attention of architects, engineers, and builders many years ago.

Unaffected by weather, highly resistant to acids, fumes, and severe temperatures, requiring no preservative treatment, little or no upkeep, Corrugated Transite has proved over the years that it is one of the most lasting and economical building materials you can use for exterior siding and roofing. It's asbestos—fire-proof, rotproof, rustproof.

In recent times, the Corrugated Transite sheets were discovered to have decorative value, especially in modern streamlined design. Today Transite is contributing structural attractiveness to smart shops, office buildings, even art galleries—inside as well as outside.

Many architects now specify a combination of Corrugated Transite and insulation for curtain walls. The versatility of this material is amazing. Ask for our brochure on Corrugated Transite, containing many stimulating ideas. Write Johns-Manville, Box 290, New York 16, N. Y.



EASY TO FASTEN TO STEEL



EASY TO SAW



EASY TO DRILL



EASY TO NAIL TO WOOD



**Johns-Manville**

*Asbestos*

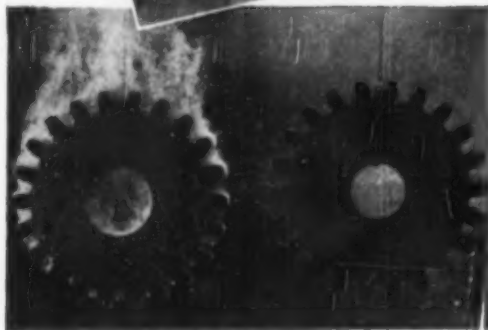
**CORRUGATED TRANSITE**

# LIFE EXPECTANCY UNKNOWN

ENRUP, new plastic by U. S. Rubber, outmodes present standards of endurance on many industrial applications



**THE GEAR THAT LOVES WEAR!** One of the many uses of Enrup plastic, is this Enrup gear which has been operating for 6 months on a heavy-duty, 30-inch lathe without showing signs of wear. Other Enrup gears have been operating for as long as a year where ordinary metal gears have failed within a few days or weeks.



**NO BATH FOR A Sissy.** See how the 20 per cent solution of sulphuric acid eats away the steel gear at left, while the Enrup gear is unharmed. Enrup is the plastic that outwears steel, is non-conductive, non-absorbent, easy to clean, makes no noise when in operation. It has high tensile and impact strength, is unaffected by oils.



**A DESIGNER'S DELIGHT.** Just a few of the many products which have been molded for lending manufacturers out of Enrup. It can be made into almost any shape or form, punched, sawed, manded, nailed, bolted, molded and machined. Smallest item weighs as little as one-third of an ounce. The largest? There's no size limitation.

Many a product is successful today because of Enrup. This new plastic is lightweight, rugged, handsome and highly workable, permits designing and engineering economies previously thought impossible. Can your product be improved by this versatile material? Our engineers will gladly tell you, at no obligation. Write to:

A PRODUCT OF



**UNITED STATES RUBBER COMPANY**

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.



# The 4<sup>th</sup> DIMENSION of Pump Value

Check Your Pump Purchases  
by These Dimensions

①

**Materials**

②

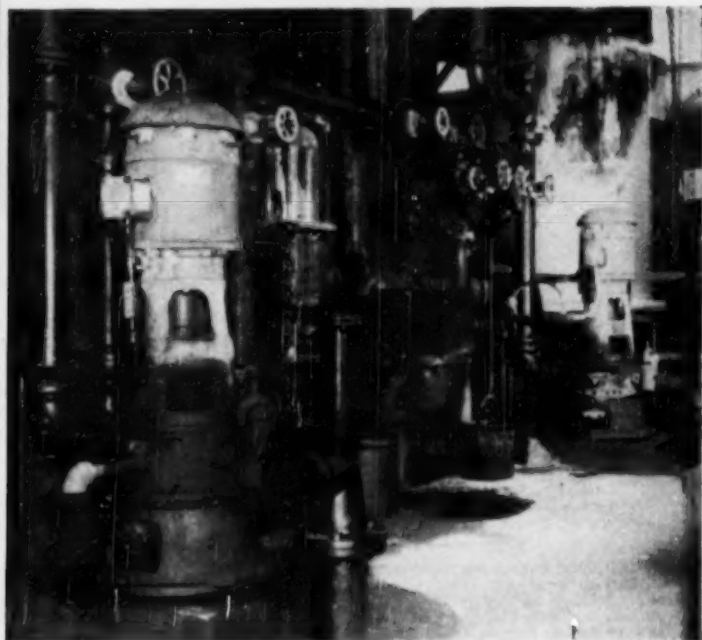
**Efficiency**

③

**Performance**

④

**Dependability**



LaBour Type G (packingless self-priming centrifugal) pumps in  
a contact acid system.

In the field of chemicals, there are four dimensions by which pump values are determined.

A wide choice of MATERIALS is necessary, and as much EFFICIENCY as you can get. PERFORMANCE, the ability to meet the specified requirements, is the third measure.

But don't stop there in choosing your chemical pumps. The fourth dimension of value can

be most important of all: DEPENDABILITY—freedom from service interruptions.

For more than 27 years, LaBour pumps have measured up by all four dimensions. That's why so many experienced operators are unwilling to take anything less for their important pumping jobs.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

# LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.



# ENCORE

*for an outstanding performance!*



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WITH CHEMICAL AND METALLURGICAL ENGINEERING

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You  
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pumps  
for

PULP AND PAPER MILLS  
DE LAVAL STEAM TURBINE CO  
TRENTON 2, N. J.

Bulletin 1100

**NOW LOOK  
AT THEM!**

Spacer couplings permit removal of the rotor without disturbing piping connections or motor alignment...an external adjustment compensates for impeller wear...eductor vanes relieve stuffing box pressure...large suction nozzles...interchangeability of parts between pumps of different types and sizes.

These and other features specified by you are fully described and illustrated in this new catalog. Write for Bulletin 1100-4-M.



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**DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.**

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS  
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS





QUESTION:

*What Packings are Specially  
good for Rotary Pumps?*

ANSWER:



So they will give long, dependable service on rotating shafts of centrifugal and rotary pumps, GARLOCK Braided Asbestos Packings are made from long-fibre asbestos yarn, impregnated throughout with special lubricants of various types.

There's a GARLOCK Braided Asbestos Packing for use against hot or cold water, alcohol, dilute aqueous solutions, oil or gasoline, mineral acids, etc. The most widely used styles for rotating shafts are listed above.

No matter what you require in the way of a pump packing, GARLOCK makes it. Let the GARLOCK representative survey your pumps and make recommendations.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK  
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**FOR WATER**

- GARLOCK 730 or 733 patented Lattice-Braid
- GARLOCK 234 Square braid
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- GARLOCK 644 Square braid—with lead strands

**FOR OIL OR GASOLINE**

- GARLOCK 237 Square braid
- GARLOCK 732 patented Lattice-Braid—with wire

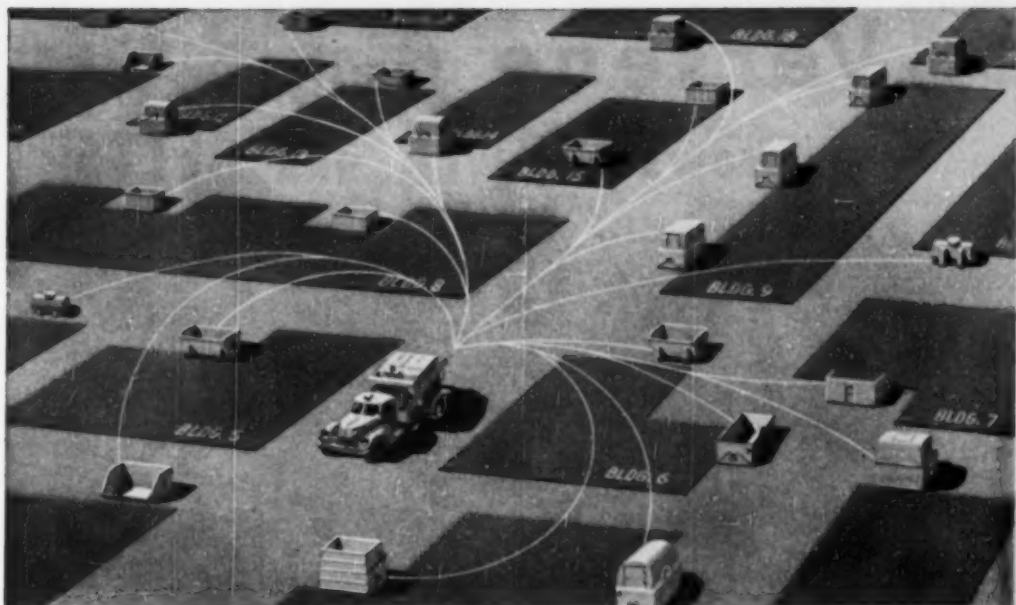
**FOR MINERAL ACIDS**

- GARLOCK 736 patented Lattice-Braid—blue asbestos
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# GARLOCK

PACKINGS, GASKETS  
AND OIL SEALS



## ★ Never Before Have You Been Able To Cut Bulk Materials Handling Costs So Drastically

Pictured above is a skeleton layout of a typical industrial plant using the Dempster-Dumpster System — one truck mounted Dempster-Dumpster handles the entire group of 26 Dempster-Dumpster containers of six different types. These big, detachable steel containers are like having 26 truck bodies for a single truck.

Any required number of Dempster-Dumpster containers are spotted at convenient materials accumulation points inside and outside your plant.

They range in sizes up to 10 cu. yds. and are made in various designs to suit your particular needs. Materials — bulky, light, heavy, solids, rubbish and even liquids—are dumped or placed in these containers. The truck mounted Dempster-Dumpster makes scheduled rounds, picks up each pre-loaded container, carries it to the point of disposal, sets it down intact or dumps the materials and returns the container for refilling. The entire operation is hydraulically con-

trolled and handled by only one man, the driver.

It is not unusual for one Dempster-Dumpster to eliminate up to 10 conventional trucks . . . reducing investment accordingly. This means cutting maintenance costs, tire and gas requirements tremendously. And, more important, it increases production with a minimum of manpower. It will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.



Above, the Dempster-Dumpster is shown in the three simple stages of picking-up, hauling and dumping an 8 cu. yd. drop bottom container . . . completing the cycle in one to two minutes. These photos show the ease with which the Dempster-Dumpster handles all containers, regardless of their type, size or whether they are bottom or tilt dumping types.

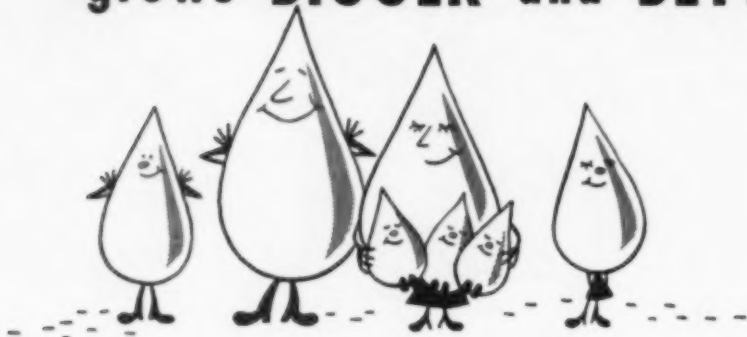
The important feature to remember is that only one truck-mounted Dempster-Dumpster and driver handles one container after another in an endless cycle, constantly on the move for economy and efficiency never before available in bulk materials handling.

**DEMPSTER BROTHERS, 260 DEMPTER BLDG., KNOXVILLE 17, TENN.**



# the **Versene**\* family...

## grows **BIGGER** and **BETTER**



To help you make your products and processes better (through the Chemistry of Chelation) two new Complexing Agents have been added to the growing family of Versenes.

**VERSENE®** is the tetra sodium salt of ethylene diamine tetra acetic acid. It is a powerful organic Complexing Agent. Available in solution or as a dry, white powder, it is extremely stable, versatile, economical and efficient. The solution is pale straw-colored. Specific gravity is approximately 1.2. In 1% solution, approximate pH is 11.75.

**VERSENE Fe3 SPECIFIC®** is for chelating ferric ions in the entire pH range. It fills the demand for a product that will complex ferric iron without precipitation, but does not need to chelate hard water salts. It is the most powerful iron complexing agent known. It is more effective as the pH is lowered, and, at pH 12 is 13 times more effective for iron than Versene Fe3. It does not affect hard water salts but will inactivate other divalent metal ions such as Cobalt, Copper and Nickel. *Versene Fe3 Specific* is available as a 47% solution with a specific gravity of 1.21.

**VERSENE Fe3®** was the first satisfactory complexing agent for inactivating trivalent iron, calcium, magnesium and other metallic salts. It softens water and inactivates iron without precipitation. Available in solution or as a dry powder. The solution is pale straw colored, has a specific gravity of approximately 1.20 and pH of approximately 11.75 in a 1% solution. The powder is white and has been adjusted with acid so that a 1% solution has a pH of 8.0.

**VERSENE T®** is for chelating ferric and divalent metal ions including hardwater salts in caustic solutions. This new product prevents iron contamination. It deactivates ferric ions above pH12 and in highly concentrated caustic solutions. Sufficient *Versene T* added to contaminated caustic solutions dissolves and complexes the iron—turns the solution *water white*. At the same time it chelates hard water salts and other divalent metals. Effectiveness decreases only when pH drops below 12. *VERSENE T* is stable and is neither attacked by nor decomposed in hot caustic solutions. It is compatible and can be mixed with the other Versenes if desired. One fluid ounce complexes at least .75 grams of iron plus 22 grains of calcium. Specific gravity is 1.18; total solids 55.5%.

**LEAD DI-SODIUM VERSEDATE®** is the lead disodium chelate of Versene. It is used as an additive to vinyl plastics to give color stability and maintain flexibility. It may also be used to lower the viscosity of starch and glue solutions. Avail-

able as 34% solution with a specific gravity of 1.3. Or as a crystalline white powder.

**DI-SODIUM DI-HYDROGEN VERSEDATE (DI HYDRATE) ANALYTICAL REAGENT.** This compound is the di sodium salt of ethylene diamine tetra acetic acid. It is widely used as an analytical reagent in the versenate Schwartzbach method of water analysis. It is a specially purified salt packaged in 50, 100 and 500 gram bottles.

**VERSENE® WATER TESTING KIT** is for easily determining total water hardness in less than 2 minutes with accuracy of 1 grain of hardness per gallon. Versenate Method. Complete Kit \$3.00 ea. Postpaid.

### HERE IS WHAT THE VERSENES WILL DO

- soften water without precipitation
- remove hardwater deposits and precipitates
- dissolve grease and food deposits
- clarify liquid soap solutions
- prevent oxidation of fats, oils, soaps, fatty acids, organic materials.
- stop reactions catalyzed by metallic ions
- aid in purification of materials
- separate metals from each other
- reduce activity of metal ions
- stabilize color and maintain flexibility in plastics
- lower viscosity of starch and glue solutions
- provide an analytical reagent in Schwartzbach method of water analysis

Send for Technical Bulletin #1. Samples of the various versenes on request.

### WAREHOUSE STOCKS:

Kraft Chemical Co., Inc., 917 W. 18th St., Chicago, Ill.  
Griffin Chemical Co., San Francisco, Los Angeles, Calif.  
Siegall Chemical Co., One Hanson Place, Brooklyn 17, N. Y.  
\*Trade Mark

**BERSWORTH CHEMICAL COMPANY**  
FRAMINGHAM, MASSACHUSETTS

# "THE BELT WITH A DOUBLE LIFE"



## QUAKER TRANSMISSION BELTING LASTS 10 YEARS . . . CUTS COSTS IN HALF !

Day and night for six years . . . regular running for more than four years. That's the service record of an eighteen inch, six ply Quaker Ironsides Endless Belt on a forty foot drive powered by a 150 horsepower steam engine. Twice the length of service of any other belting . . . a saving of more than \$400.00.

More proof of why more plants are specifying Quaker for quality. Each and every Quaker Belt is designed for a par-

ticular job . . . pre-tested and performance proved for maximum service and lower operating costs.

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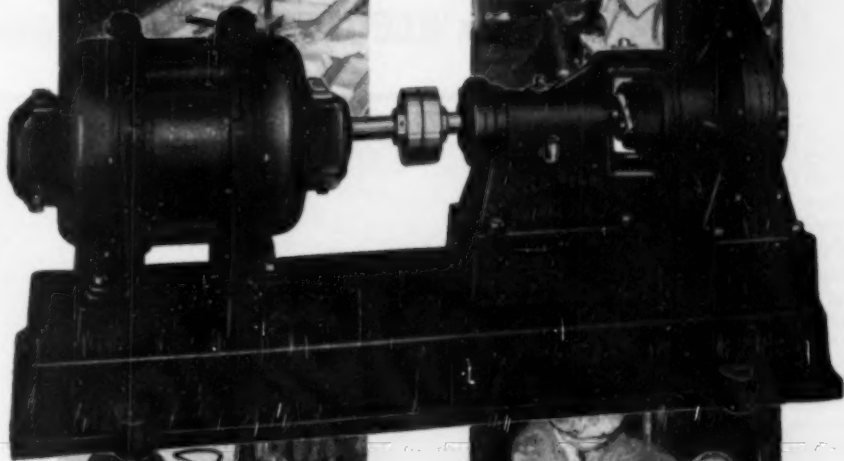
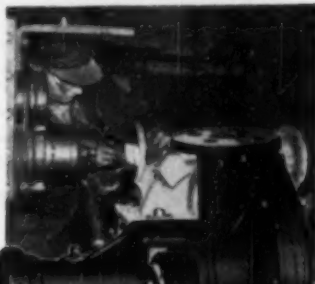
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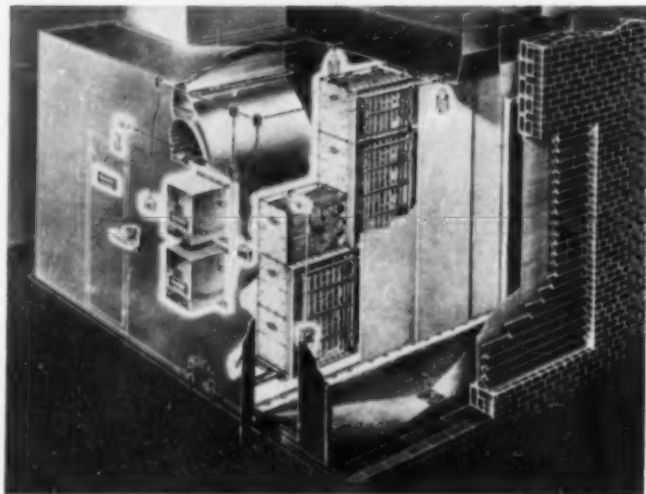
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News about



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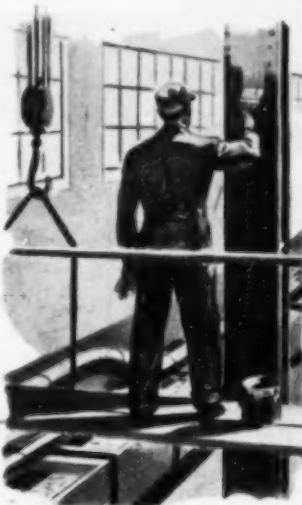
Here's more evidence to show that the system of coatings with the right degree of chemical resistance gives outstanding results even under severest service conditions.

**1. LARGE NORTH CENTRAL PRODUCER OF CHEMICALS** has used Ucilon Coatings extensively on structural work and equipment. Applied to interiors of brine tanks, Ucilon Coating System is still in excellent condition after more than 5 years.

**2. IN WELL KNOWN CORN PRODUCTS REFINERY**, the Ucilon Coating System used was in tip-top condition after a year on alloyed steel tanks, which, when left unprotected, had been badly etched in weeks—despite the special steel.

**3. IN TEXTILE PROCESSING PLANT**, Ucilon Coating System was applied to dye-house salt machine. Two years later, the protective system was still intact. Maintenance man reported Ucilon Coatings were the only ones that were successful, others being broken down within weeks by the wet salt.

You'll find many Ucilon Coating Systems ready to give service-proved protection against this broad group of chemicals: Acids, alkalis, salt solutions, petroleum and its derivatives, water, oxidants. Coating systems have been engineered for conditions which include fumes, splashing or continuous contact with these agents. Comparing these systems are tough vinyl,



phenolic, fish-oil, chlorinated rubber or other coatings, and special wash primers, primers and intercoats where required.

Learn how you can get better protection and savings in painting costs with Ucilon Coatings. Write—outlining your problem. We'll send details on the recommended coating system.



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Often the solution to packaging problems involving the newer chemicals can be found in highly chemical-resistant Unichrome Drum Linings.

Take the new wetting agents, for instance. They tend to cause rusting in ordinary drums. Used with textiles, rust-contaminated wetting agents can cause staining. So one particular company packaged with glass—until it found that Unichrome Drum Lining Series B-124 permitted use of steel drums without risk of rusting. Not only did this method cost less than glass, but also eliminated breakage.

Unichrome Drum Linings are available for a wide variety of products to prevent corrosion of container, and contamination. Write for data.



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Here may be your answer for protecting lighter or less costly metals from strong chemical corrosion. Consult "Coatings for Metals" headquarters for more information.

# 95 Per Cent Efficient . . .



## ... recovering fiber stock from waste white water

That's how efficiently the 1000-gal.-per-minute Marx SAVEALL shown at the left operates at the Dallas, Texas, plant of Fleming and Sons, Inc.

Approximately 100 tons of paper board is produced every 24 hours at this plant. The Marx SAVEALL reduces suspended fibrous solids in the waste water from 3.5 to 0.17 lbs. per 1000 gals.

Simple natural forces are all that are required to accomplish the clarification process economically and efficiently in a Marx SAVEALL. No chemical coagulants are needed, settlement taking place by gravity (see diagram below). No moving parts are involved and there is no opportunity for mechanical failures to occur.

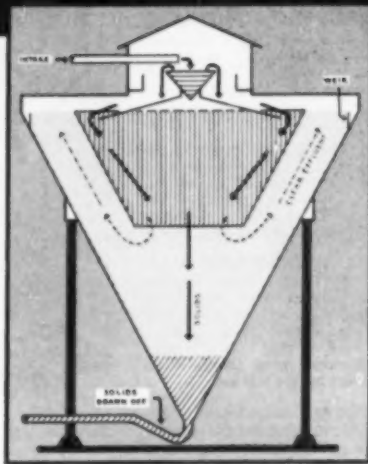
## How the SAVEALL works

The Marx SAVEALL consists primarily of two large cones made of steel plates, one mounted inside the other, as shown in the diagram at the right. The inner cone is relatively short and thus has a large opening at the bottom.

There is a small receiving well at the top of the unit, with an inverted deaeration cone directly underneath it. At the Fleming plant, all overflow white water from the paper machine is collected in a common chest. This waste white water is fed into the receiving well at the top of the SAVEALL, overflows onto the deaeration plate (where the air bubbles are shaken loose from the solid particles) and runs off its edge. Suspended fibers settle through the inside cone and collect in the bottom of the outside cone. Water, minus most of the solids, rises between the two cones and flows over a circular weir into a draw-off channel.

The clarified effluent from this SAVEALL is returned by gravity to a storage tank in the mill and re-used in the beaters and white water showers. Overflow from the tank runs off to the sewer.

Our nearest office will be happy to furnish an estimate for the proper size Marx Saveall for your requirements. When requesting quotations, please send us information about the volume of liquid to be clarified, the concentration of suspended solids, and the rate of settling.



Marx SAVEALLS are typical examples of the special steel plate structures we build for the chemical and other processing industries. Let our engineers work with you the next time you need steel plate process equipment of any type.

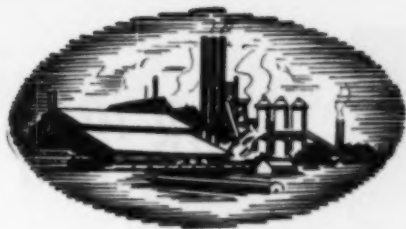
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America has set an amazing record of progress in 50 years—but a moment in the history of civilization. A record unequalled by any other political or economic system.

Merely by broad brush strokes, we can all visualize this miracle. Remember the crystal set, the hand-cranked car, the biplane? A far cry from our FM radio, television, hydro-matic drive and supersonic planes.

And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

- ★ Since 1900 we have increased our supply of machine power  $4\frac{1}{2}$  times.
- ★ Since 1900 we have more than doubled the output each of us produces for every hour we work.
- ★ Since 1900 we have increased our annual income from less than \$2400 per household to about \$4000 (in dollars of the same purchasing power), yet . . .
- ★ Since 1900 we have cut 18 hours from our average work week—equivalent to two present average workdays.

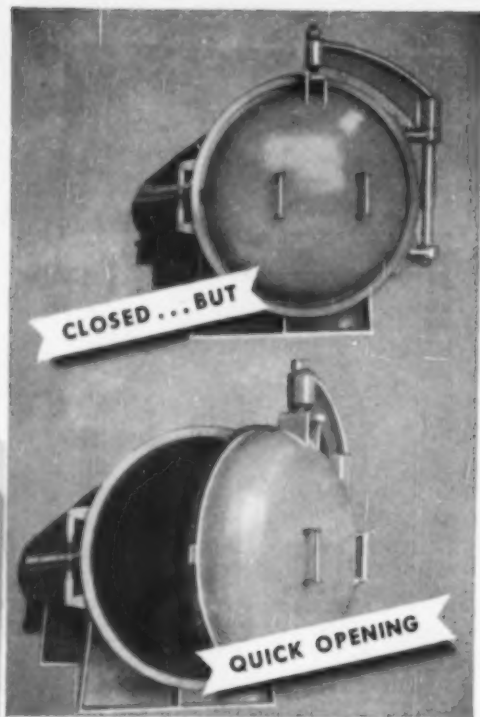
How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

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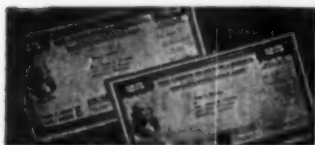
# America finds a new, easy way to save

Out of the war has come one blessing—a lesson in thrift for millions of those who never before had learned to save.

Enrolled under the Payroll Savings Plan in thousands of factories, offices, and stores, over 27 million American wage earners were purchasing "E" Bonds alone at the rate of about 6 billion dollars worth a year by the time V-J Day arrived.

With War Bond Savings automatically deducted from their wages every week, thrift was "painless" to those wage earners. At the end of the war, many who never before had bank accounts could scarcely believe the savings they held.

The moral was plain to most. Here was a new, easy way to save; one as well suited to the future as to the past. Result: Today, millions of Americans are continuing to buy, through their Payroll Savings Plan, not War Bonds, but their peacetime equivalent—*U. S. Savings Bonds*.



**From war to peace!** War Bonds are now known as U. S. Savings Bonds, bring the same high return—\$85 for every \$18.75 at maturity.



**Out of pay—into nest eggs!** A wage earner can choose his own figure, have it deducted regularly from earnings under Payroll Savings Plan.



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**Keeping cost of living in check!** Buying only needed plentiful goods and saving the money which would bid up prices of scarce goods keeps your cost of living from rising. Save automatically—regularly.

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18.75	975.00	27,833.76

**Savings chart.** Plan above shows how even modest weekly savings can grow into big figures. Moral: Join your Payroll Savings Plan next payday.

**SAVE THE EASY WAY...  
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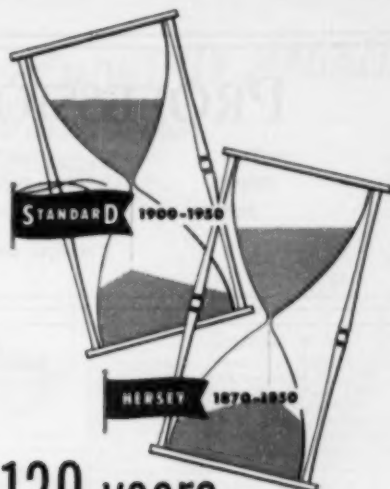
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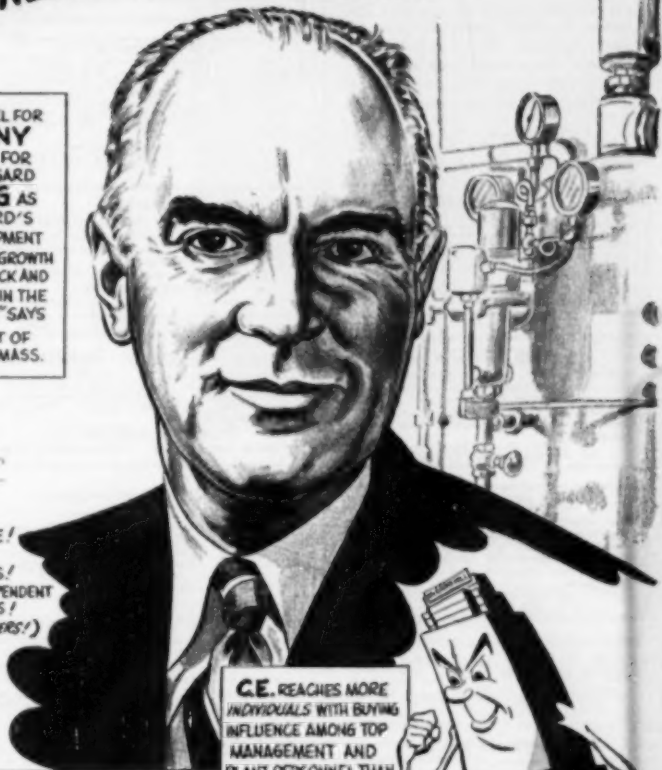
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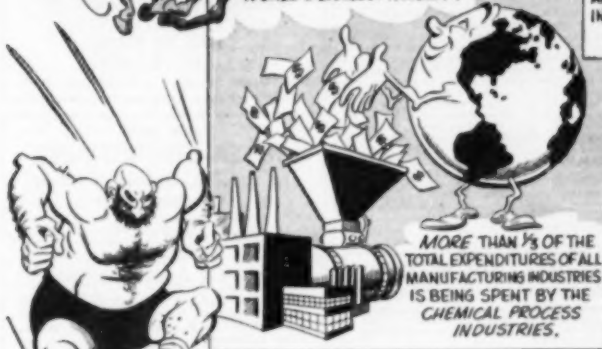
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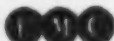
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2879/L6—Stainless Reactor 300 gal.; 36"x60"; dished heads.

2879/L5—Two S.S. Reactors same as above but JACKETED; dished heads.

2834 C2—NEW Steel Jacketed Vacuum Receiver; 400 Gal. 3'x7".

1017/A—Three Struthers Wells Type 302 Stainless Vacuum Reactors; 4'6"x2'11".

Elmcas Stainless Drum Filter, 4'x6".

Oliver Dorco Type 4'x1' Filter.

Oliver Drum Filters with Nickel, Rubber and other Non-Corrosive contacts; Sizes: 5'x16", 6'x2", 6'x44", 8'x10", 8'x12", 11'x18".

Fosco Filters; acid resistant; string type; 8'x18" and 10'x16".

2 Bird Continuous Centrifugal Bowl Type Filters; Stainless Steel, 18"x28".

2 Bird Continuous Solid Bowl Centrifugals 40" 60" with contacts of Rubber and Hastelloy.

1 Bird Continuous Centrifugal Filter 36"x72" with Manel contact parts.

3 Laughlin Filters, 30" and 36".

4 Baker Perkins "Termore" Type S 48.

4 Baker Perkins "Termore" Model HS 1600; 63"x25".

Buhrstone Lined Pebble Mills, same with XPL proof motors; 18"x24", 34"x60", 62"x72", 62"x83".

Standard Make Steel and Manganese Lined Ball Mills; Sizes: 30"x20", 3'x3', 4'x4', 4'x7', 6'x6", 58"x84", 6'x8".

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137 Hudson Street,  
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FRED'K R. FIRSTENBERG, Pres.

**CARLYLE**  
INDUSTRIAL RUBBER PRODUCTS  
HIGH LEAK PROOF

**VARI-PURPOSE HOSE**  
**NOT THIS**

**BUT THIS!**

Diligent and careful research has produced a new hose eliminating the necessity and expense of having several different types of hose on hand for your various requirements. VARI-PURPOSE Hose offers a minimum of inventory. A coil of VARI-PURPOSE HOSE will satisfactorily meet your needs in handling all of the following . . .

- AIR • WATER • GAS • OIL
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VARI-PURPOSE hose is the latest development in hose manufacturing and has the following features . . .

- Braided Carcass of Dupont's Cordura Rayon
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**AVAILABLE IN**  
**COILS 25, 50, 100, 250 & 500 FT.**  
**Stock Numbers VP-203A**

Inside Diameter	Byrd	Working Pressure	Outside Diameter	Weight 100 Ft.	Price Per Ft.
1/4"	1	250 Lbs.	1/2"	9 Lbs.	\$ .11
1/4"	2	300 Lbs.	5/8"	15 Lbs.	12
5/16"	1	250 Lbs.	39/64"	13 Lbs.	12
5/16"	2	300 Lbs.	21/32"	15 Lbs.	14
3/8"	1	250 Lbs.	11/16"	15 Lbs.	14
3/8"	2	300 Lbs.	3/4"	19 Lbs.	17
1/2"	1	200 Lbs.	7/8"	23 Lbs.	18
1/2"	2	250 Lbs.	29/32"	25 Lbs.	27
3/4"	2	250 Lbs.	1 1/4"	45 Lbs.	33
1"	2	250 Lbs.	1 1/2"	55 Lbs.	42

**Extremely low prices.**  
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### FOR SALE

Pumps: 60 GPM. stainless steel, reciprocating.  
Kettles: 700 gal. Deep Jacketed agitator.  
Dryer: Atmospheric Smoke Gas single drum.  
Dryers: 2 Davenport 6'x6' hot air rotary.  
Filter Presses: 7' x 9", 9' x 10", 12' x 24', 26'.  
Autoclave: 10 gal. Ballman, cast iron.  
Pebble Mills: 30x42", 48x60", 54x", 63x".  
Vacuum Pans: 50 gal. and 6" copper.  
Pulverizers: Mikro 27TH and 24".  
Centrifugal: Rochester 30" suspended.  
Miscellaneous: W. & P. 20 gal. jacketed.  
Conical Mill: Hardinge 6'x22" bare, lined.  
Reactor: 200 gal. Pfander glass head.  
Tube Filter: Stokor 90-C automatic and closer.  
Rubber Mixer: 60 cu. ft. stainless steel.  
Rubber Mixers: 50 cu. ft. jacketed stainless steel.

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**Wagner**  
CERTIFIED REBUILD

**Immediate Stock Shipment**

**Squirrel Cage Motors**

H. P.	Mfr.	Type	Speed
200	G.E.	TEFC	1800
150	G.E.	TEFC	1725
100	G.E.	TEFC	1200
100	Reliance	TEFC	1800
100	Reliance	TEFC	2000
100	Coast	Exp. Pt.	1200
100	Reliance	TEFC	1200
75	Reliance	TEFC	1200
75	Reliance	TEFC	900
60	G.E.	TEFC	1800
60	Reliance	TEFC	1200
60	Reliance	TEFC	1200
40	Reliance	TEFC	1800
30	Al. Ch.	TEFC	900
30	G.E.	TEFC	1800

**Expl. Proof & TEFC up to 25 HP.**  
★ GEARHEAD MOTORS, NEW & REBUILT.  
★ SPEED REDUCERS, V-DRIVES.  
★ FANS, BLOWERS, PUMPS.  
★ 25 CYCLE & D. C. MOTORS.  
High Quality & Full Guarantee Since 1906

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Totally Enclosed, Fan Cooled Motors are constantly being required for your industry. You will effect a real saving on rebuilt guaranteed electric motors—motors carrying the same guarantee as new. Following is a partial listing. If you need one not shown, please get in touch with us.

### ALL TEFC—BB SQUIRREL CAGE MOTORS

HP	RPM	VOLTS	IMFR.
125*	1200	440	G. E.
75	1200	230/440	G. E.
60	900	440	G. E.
40	1200	440	Reliance
40	1200	440	Westing
30	900	440	G. E.
20	1200	440	Wagner
20	900	440	Century
15	1200	220/440	Century
15	900	440	G. E.
10	3600	220/440	J. M.
10	1200	220/440	G. E.
7 1/2*	1800	220/440	Delco
7 1/2*	1200	220/440	G. E.
7 1/2*	900	220/440	G. E.
4	3600	220/440	Delco
4	1800	220/440	Delco
4	1200	220/440	Wagner
3	3600	220/440	Delco
3	1800	220/440	Delco
3	1200	440	G. E.
2	900	220/440	G. E.
2	1800	220/440	Howell
2	1200	220/440	Reliance
2	900	220	Wagner

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Also complete stock of Hip Ring, Synchronous, D. C. Motors, Motor Generator Sets and Control.

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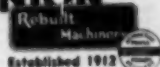
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Power Equipment

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## GUARANTEED FOR COMPLETE SATISFACTION



Stokes and Smith G1 and G4 semi automatic Auger Fillers.

Knapp E adj. Wraparound and Spot Labeler, 1 gal. (also for jars with ears).

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F. J. Stokes DDS2 23-punch Rotary Tablet Machine.

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Colton 4PF Cream Filler.

Filler 1, 2, 4, and 8 Head stainless steel Piston Fillers.

Standard Knapp No. 429 Carton Sealer, 8 ft. Compression Unit.

Package Machy. FA, DF, FAQ, and FA2Q; Scandia and Miller Wrappers.

Mikro 4TH, 2TH, 15H and Bantam Pulverizers; Jay Bee JAT & U1; Schutz-O'Neill, Stedman Cage Mills.

Lee 400 gal. stainless steel 90 lb. jacketed Mixing Kettles.

Baker-Perkins and Readco Heavy Duty 100-150 gallon Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

F. J. Stokes, J. H. Day, New Era, Hattman Mixers, from 2 gallons up to 450 gallons, with and without Jacketed, Single and Double Arm Agitators.

Robinson 800 lb. stainless steel Dry Powder Mixer.

Day and Robinson 100, 800, 2000, 2400 lbs. Dry Powder Mixers and Sifters.

Huhn and Hersey Steam and Gas Fired Rotary Tubular Dryers.

Hersey 6' x 23' Rotary Steam Dryer.

Kent Three Roll Roller Mills, 12"x30" and 16" x 40" sizes.

Houchin Aiken 2000 lb. Soap Crutcher.

Houchin Aiken and N.E. Soap Mills.

Day #31 Ro-Ball and Schutz-O'Neill #3 Sifters; Gayco 8 ft. Air Separator.

Pony M, AAX and ML Duplex Labelites, World Semi and Fully Automatic Rotary and Straightaway Labelers.

Horix S.S. Rotary and International

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Ertel 12 Head and Hand Semi Automatic Vacuum Fillers.

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**TOP PRICES PAID  
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### FOR SALE OR LEASE LOCOMOTIVES

- 2-100 ton 660 HP Baldwin diesel electric, four traction motors.
- 1-65 ton Whitcomb diesel electric new 1942, excellent condition.
- 1-30 ton Whitcomb 300 HP diesel electric, inactive effort 30,000.
- 2-30 ton diesel operated switching locomotives new 1942, Full ICC.
- 1-30 ton Vulcan 6-6-0 side tank steam switcher, new 1942.
- 1-30 ton American 6-6-0 steam switcher, tender type, new 1942.
- 5-Type 2-8-4 steam road engines new 1940, finest condition.

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- 1-25 ton, Ohio, steam, new 1942.

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- 50—all steel 70 ton capacity hopper.
- 25—Composite type box, 40 ton capacity.
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PRIVATE CAR—COMPLETED JANUARY 1950.

### SPECIAL!

- 36" Gauge equipment—45 ton Whitcomb diesel electric locomotive, Baldwin 50 ton steam locomotive new 1930, Five 30 ton steam switchers, 34 Western 3 cu. yd. dump cars, 90" Miles Wheel Lathe, new 1944 110" Turntable—fine condition.

Our stock includes many other locomotives, cars, cranes and heavy equipment items. We invite your inquiry.

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## GOOD EQUIPMENT FOR SALE

4 Stainless Steel T347 Bubble Cap Columns, 6' dia. x 30' high, 20 plates.

2 Sharples #10V Vaportite Super Centrifuge dual purpose bowl, stainless steel bowl, covers and other contact parts.

3 Stainless Steel T347 Kettles, 1000 gal.; 8' dia. x 3' deep, dished bottom, flat bolted cover, heavy duty agitator, reducer and 35 HP 4-speed motor.

2 Spencer Turbine Co. Gas Boosters or Compressors, 600 CFM @ 85 ps. 37", Stainless Steel, 30 HP motors.

2 Stainless Steel T347 Tanks, 3450 gal.; 8' dia. x 7'3" deep, 2" pipe coils.

1 Aluminum Kettle, 1000 gal., closed, jacket, coils, and motor driven agitator.

1 Swenson Rotary Vacuum Filter, Precat., 8' x 6', acid proof.

1 Sweetland #10 Filter.

1 Deep Well Pump, 150 GPM, 225' suction, 100' discharge, 20 HP motor—in original crates.

1 Lab. size double arm heavy duty mixer, jacketed, 3 sets rotors, 3 covers, 2-speed motor.

2 Double Drum Dryers, 22" x 38".

### LIQUIDATING EQUIPMENT COMPLETE DISTILLERY

10' dia. Beer Still, Gin Still, Water Still, Yeast Washline, Water Conditioners, Tanks, Tank Scales, Pumps, Conveyors, Automatic Bottling Line, etc.

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### RUBBER LINED STORAGE TANK

- 1-12,000 Gallon Rubber-Lined Storage Tank 10'8" x 17', lined with 316 Acid Resistance Rubber, Tank pressure 25 lb. p.s.i. Excellent Condition.

PK-4735, Chemical Engineering  
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- 6-25,000 gal. Horiz. 10' x 50' Shell 3/4"
- 1-10' x 20', 2-10' x 10', 1-10' x 24" oil to in. Shell Butt Welded Horiz.
- 2-10,000 lb. New Vert. Tanks
- 8-12,000 & 15,000 & 20,000 gal. Cap. Horiz.
- 50-New 10,000 gal. Horiz. 60 lb. Test

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## FILTERS

- 1-Sweetland #12, with 36 leaves, 6" centers.
- 2-Sweetland #12, stainless, with 12 leaves.
- 3-Oliver Rotary Vac., 11" x 18", 8" x 12", steel.
- 4-Jennison 5' x 5' Rotary Vac. steel drum.
- 5-Oliver Rotary Vac. 3' x 2', wood drum.
- 6-Whitaker 12" x 12" P&F, 12 chambers, C. I.
- 7-Sperry 30" x 30" P&F, 36 chambers.
- 8-Whitaker 30" x 30" C. I. P&F, 36 chambers.
- 9-Wagner 22" stainless, pressure type.
- 10-Whitaker, heavy stainless and wood P&F, 10" to 42".

## PULVERIZERS AND MILLS

- 1-Williams "Comet" 4-roll High Side Mill.
- 2-Patterson, Ashby 30" x 42", 30" x 30" porcelain-lined Pebble Mills.
- 3-Whitaker 3' x 4', 2' x 3' Pebble Mills.
- 4-Patterson 3' x 18" steel Tube Mill, m.d.
- 5-Hardinge 5' x 52" Conical steel-lined Ball Mill with feeder, classifier and motor.
- 6-McIntire Pulverizers, 4TH, 2TH, 20M, 18M.
- 7-Ball & Jewett 21 and 23" Rotary Cutters.
- 8-Premier Colloid Mills 8", 6" dia., S.S.

## SCREENS

- 4-Rotex #21 and #32 Single & Double Deck, stainless steel, with 40" and 120" screens.
- 4-Rotex #21 Single Deck 40" x 120", 100" x 84".
- 6-Tyler Hammer 6' x 10' & 8' x 5'.

## KETTLES

- 1-8.5, 7' x 8', agitated with S.S. coil.
- 2-Stainless Steel, jacketed, Agitated Reactors, 2000 and 100 gals.
- 4-Steel 250 gal. steam jacketed, agitated.
- 10-Stainless 30 to 300 gal. jacketed.

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- Rotary Positive Blowers
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Rebuilt - New - Used  
Since 1933

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## NEW AND GOOD-AS-NEW EQUIPMENT

Stainless Steel Tanks, new, 100 and 200 gal., dished bottoms with stands.

- 1-Chrome Tank #2430, vertical, with dished bottom, 3/2 plate, and cover.
- 2-Steam Jacketed Kettles, Stainless Steel, Copper & Aluminum 5 to 250 gals.
- 50-Pumps, steam and electric.
- 4-New Glass Mach Centrifugal Pumps 160 gpm at 40'.
- 1-Bufflovak impregnating Tank, 42" x 52", steam jacketed.
- 2-Flow-Master Kam-bi-motors.
- 1-Ribbon type Mixer, steam jacketed.
- 4-Steel Tanks, 100,000 gals. each.

SPECIAL 1—New 100 H.P. Boiler 300# w.p. with grates, stack & fittings—\$4,800.00

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Portable and Stationary

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Vacuum - Transfer - Circulating

PUMPS

Stainless Steel - Bronze - Iron

Rubber - Lead - Aluminum

AIR COMPRESSORS • BLOWERS •

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EQUIPMENT CO. INC.

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ABSORBER—HCl Alberger, Karbate construction, 18 ton/day. (Unused).

AUTOClave—Jacketed, 6'x8", S.S. clad, 40# WP, ASME.

BOILER—Downtherm, 300,000 BTU, 150# pressure, Natl. Board, gas fired.

WEMCO CLASSIFIER—No. 71, Type BHL spiral classifier, 22' long. Unused, in original crates.

DRIVERS—Bufflovak, single drum, Vacuum, 24"x20" S.S. drum, vari-drive w/vacuum pump.

Spray, 2'x2", S.S. electrically heated.

FILTERS—6'x18" Oliver, continuous.

3' x 4' Oliver, continuous, 30 Type 304 (UNUSED).

Sweetland No. 12, 72 leaves, 2" spacing.

HEAT EXCHANGERS—Karbate 16.5 sq. ft.

(The above is only a partial listing of our inventory. Send us your inquiries.)

# Heat and Power Co., Inc.

70 PINE STREET Digby 8-0373 NEW YORK 5, N. Y.

- 4-Stainless Vertical Tanks, 7'3" x 14", with side entering agitators.
- 2-Stainless Horizontal Tanks, 6'3" x 14", with stainless coils.
- 2-Bufflovak 9' dia. Crystallizers.
- 2-Copper Vac. Still 70 lb 500 gal.
- 1-Centrifuge, Calandria Type, 6'3" C.I. bodies, copper tubes, with condensers, 1000 sq. ft.
- 2-Evaporators, Calandria Type, 6'3" 7", all copper, with condensers, 1000 and 1100 sq. ft.

## MIXERS—ALL TYPES

- 1-Banbury 200 Mixer with 10HP motor & forced feed lubrication.
- 5-Baker Perkins 100, 50, 20 and 5 gals., jacketed, Double Arm.
- 1-Baker Perkins 2-gal. stainless, Double Arm.
- 1-Day 24 Cincinnati, jacketed, Double Arm, 100 gal.
- 10-225 Robbins 100 to 2000 Powder Mixers.
- 1-Crescent 60000 Steel Powder Mixer.
- 1-Mason 32 cu. ft. steel Central Blender.
- 20-Electric Portable Agitators, 1/2 HP to 5 HP.

## DRYERS—KILNS

- 4-Rotex Eng. 2-Truck Atmospheric Dryers, steam heated, 100 sq. ft. drying surface; has single units or multiples.
- 2-Bufflovak 4' x 9', 32" x 100", 32" x 72" Atmospheric Double Drum.
- 2-Bufflovak 4' x 9', 32" x 5' x 4', 4' x 5' x 8' Single Drum Drums.
- 6-Alite Chemicals Rotary Kilns 9'6" x 230', 7'6" x 120', 6' x 80'.
- 1-Vulcan 7' x 60' Kiln with 9' x 40' Dryer and 2' x 30' Cooler.

## CENTRIFUGALS

- 2-ATAM 40" and 40" Suspended Type with stainless steel impellers and perforated buckets, custom designed, m.d.
- 1-ATAM 40" Suspended, monel perforated bucket.
- 1-Tolbert 40" Suspended, rubber perforated bucket.
- 1-Tolbert 32" Suspended steel impervious bucket.
- 1-Tolbert 32" Suspended monel perforated bucket.
- 1-ATAM 30" Suspended stainless impervious bucket.
- 2-Tolbert 20" rubber-covered buckets.
- 1-Bird 18" x 28" monel, solid bowl, continuous.
- 2-Bird 30" x 18" solid bowl, continuous.
- 1-Sharples 210V stainless, 2HP motor.

## MISCELLANEOUS

- 1-Rosag #420 Carton Sealer with Compression Unit.
- 6-Anderson Dye, 21 Expellers.
- 6-Bash, Hydr Vapour Press, to 100 cfm.
- 6-Olivin solid-wood Centrifugal Pumps, 2 1/2" x 3", m.d.
- 5-Bedgers, Stokes & Smith Powder Filters.
- 2-Rosag Automatic Can Labelers to 610 cont.

5-Steel Tanks, 67,300 gals. each.

1-300 gal. Vert. Glass-Lined Tank.

1-150 gal. Jacketed Glass-Lined Tank with agitator.

1-Sweetland Filter, No. 3, 15 leaves.

1-Sperry Filter, 18 x 18-24 plate.

2-Plate & Frame Filters, 25" open del.

1-Patterson Pebble Mill, 36" dia. x 42", porcelain lined.

2-Ramose Rotary Agitator, 9' dia. x 11'6".

6-Stokes Rotary Tablet Machines RD4.

10-New Sharples Oil Facilities.

6-New Cleveon Can Filling Machines.

1-New 100 H.P. Boiler 300# w.p. with grates, stack & fittings—\$4,800.00

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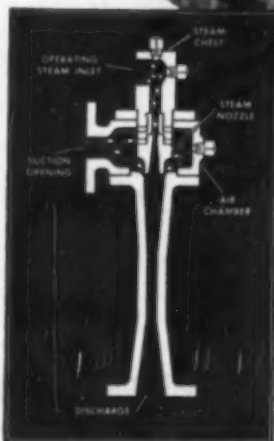
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*Steam jet*  
**EJECTORS**

One of three Elliott two-stage ejectors at the Hercules Burlington, N. J., plant, which maintain absolute pressures of 1 in. Hg and lower in resin kettles.



Single-stage ejector, showing operating principle.

**HERE'S HOW THEY DO IT** at the new Hercules Powder Company plant at Burlington, N. J., where synthetic resins of various properties are manufactured for a variety of needs. Three Elliott two-stage ejector units, of different vapor handling capacities, are utilized to maintain absolute pressures of 1 in. Hg and lower in the various resin kettles.

The ejectors, operating on 125-psig steam, dry and saturated, use surface type intercondensers to avoid contamination of plant water and also to insure a minimum of waste disposal. Since the ejectors require practically no maintenance, they can be installed near the ceiling, out of the way.

These units, continuously operated, have aided the Hercules plant in the rapid readjustment of process required in producing in a single month, 25 different resins, in four kettles, to meet customer requirements.

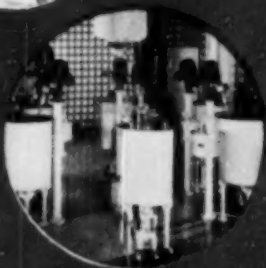
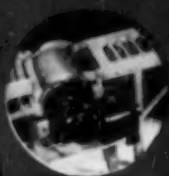
*Discuss your vacuum problem with Elliott engineers. Ejector bulletin on request.*

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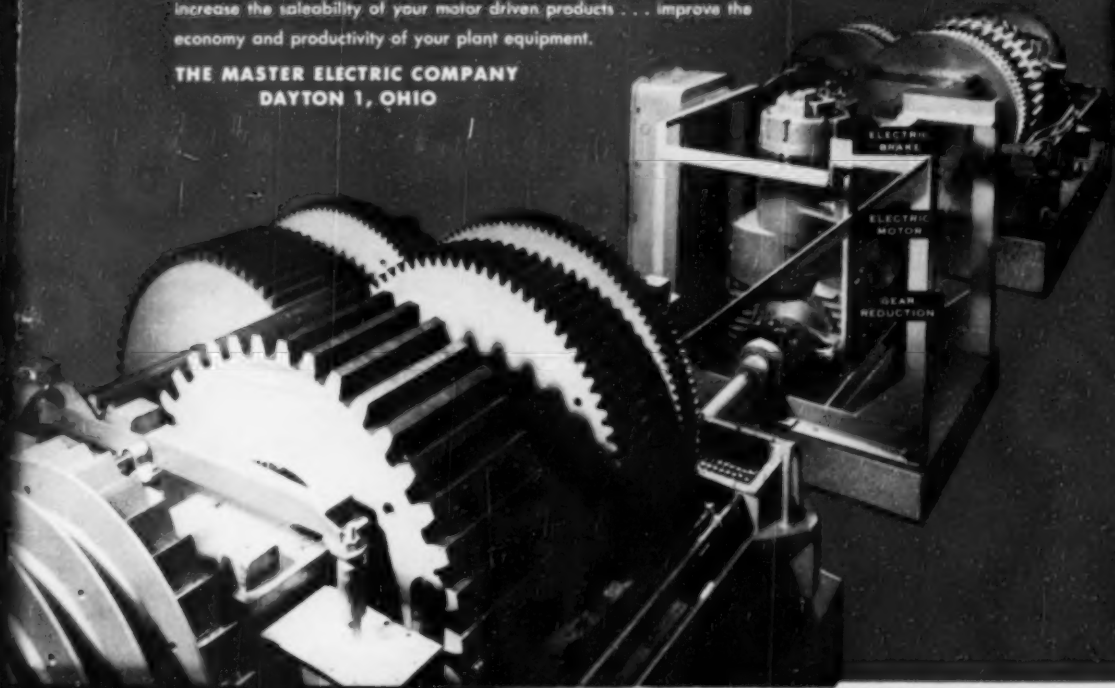
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